المملكة العربية السعودية

وزارة التعليم

MINISTRY OF EDUCATION

هام

لكل المهتمين و المهتمات

بدروس و مراجع الجامعية

مدونة المناهج السعودية eduschool40.blog

(Appendix D) مراجعة دائرة الوحدة $\cos(0) = 1$

3.3 نظرية الساندويتش

The Sandwich Theorem: (1)

1) $\lim_{x\to 0} x^2 \cos\left(x + \frac{1}{x}\right) = 0$ ، $\lim_{x\to 0^+} \sqrt{x}\cos\left(\frac{\pi}{x^2}\right) = 0$

2) $\lim_{x\to 0} (x+5x^2)\sin\left(\frac{e}{x}\right) = 0$

Theorem:

1) $\lim_{x\to 0} \frac{\sin x}{x} = 1$ ، $\lim_{x\to 0} \frac{\sin(nx)}{(mx)} = \frac{n}{m}$ ، $\lim_{x\to a} \frac{\sin(x-a)}{(x-a)} = 1$

2) $\lim_{x\to 0} \frac{mx}{\sin(nx)} = \frac{m}{n}$ ، $\lim_{x\to 0} \frac{\sin(nx)}{\sin(mx)} = \frac{n}{m}$

3) $\lim_{x\to 0} \frac{\tan x}{x} = 1$ ، $\lim_{x\to 0} \frac{\tan(nx)}{(mx)} = \frac{n}{m}$

4) $\lim_{x\to 0} \frac{nx}{\tan(mx)} = \frac{n}{m}$ ، $\lim_{x\to 0} \frac{\sin(nx)}{\tan(mx)} = \frac{n}{m}$ ، $\lim_{x\to 0} \frac{\tan(nx)}{\tan mx} = \frac{n}{m}$

5) $\lim_{x\to 0} \frac{\sin^p nx}{m x^p} = \left(\lim_{x\to 0} \frac{\sin nx}{mx}\right)^p = \left(\frac{n}{m}\right)^p$

6) $\lim_{x\to 0} \frac{\tan^p nx}{m x^p} = \left(\frac{n}{m}\right)^p$

7) $\lim_{x\to 0} x\tan\frac{1}{x} = \lim_{x\to 0} \frac{\tan\frac{1}{x}}{\frac{1}{x}} = 1$ (by sequeeze theorem) ، $\lim_{x\to 0} x\sin\frac{1}{x} = 0$ ($\cos$ محصورة بين -1 و 1، $x \to 0$)

8) $\lim_{x\to 0}\left(\frac{\cos x}{3} + 2x^2 - \frac{x}{\tan x}\right) = \frac{1}{3} + 0 - 1 = -\frac{2}{3}$

9) $\lim_{x\to 0} \frac{\sin(1-\cos x)}{(1-\cos x)} = 1$ ، $\lim_{x\to 0} \frac{\sin(\sin 2x)}{\sin 2x} = 1$

---

1) $\lim_{x\to 0} \frac{1-\cos^2 x}{1-\cos x} = 2$ ، $\lim_{x\to \frac{\pi}{2}} \frac{1-\sin^2 x}{1-\sin x} = 2$ ، $\lim_{x\to \frac{\pi}{4}} \frac{1-\tan^2 x}{1-\tan x} = 2$

2) $\lim_{x\to 0} \frac{1-\sin^2 x}{1-\sin x} = 1$ ، $\lim_{x\to 0} \frac{1-\tan^2 x}{1-\tan x} = 1$

3) $\lim_{x\to 0} \frac{\sin^2 4x}{\sin^2 x} = \left(\lim_{x\to 0} \frac{\sin 4x}{\sin x}\right)^2 = (4)^2 = 16$ ، $\lim_{x\to 0} \frac{\sin 3x^3}{x^3} = 3$

4) $\lim_{x\to 0} \frac{\sin x^2}{x} = \frac{0}{0}$ (L.H) $\lim_{x\to 0} \frac{(2x)(\cos x^2)}{1} = (0)(1) = 0$

(3.3) سكشن

Note:

1) تعويض مباشر

$$\lim_{x\to 0} \sin\frac{(\text{عدد})}{x} = \sin(\infty) \to D.N.E \quad \longrightarrow \therefore \sin(\pm\infty) = D.N.E$$

$$\lim_{x\to 0} \cos\frac{(\text{عدد})}{x} = \cos(\infty) \to D.N.E \quad \longrightarrow \therefore \cos(\pm\infty) = D.N.E$$

2) $\boxed{\lim_{x\to\infty} \frac{\sin x}{x} = 0}$ ($\boxed{\lim_{x\to\infty} \frac{\cos x}{x} = 0}$ (by sequeeze theorem)

$\frac{-1}{x} \le \frac{\sin x}{x} \le \frac{1}{x}$

$0 = 0 = 0$

تعويض مباشر 3) $\lim_{x\to\infty} \sin\frac{(\text{عدد})}{x} = \sin(0) = 0$ ($\lim_{x\to\infty} \cos\frac{(\text{عدد})}{x} = \cos(0) = 1$

4) $\lim_{x\to\infty} \frac{\sin^2 x}{x^2} = \left(\lim_{x\to\infty} \frac{\sin x}{x}\right)^2 = 0^2 = 0$ ($\lim_{x\to\infty} \frac{\cos^2 x}{x^2} = 0$

5) $\lim_{x\to\infty} x \tan\frac{1}{x} = 1$ ($\lim_{x\to\infty} x \sin\frac{1}{x} = 1$ (let $t = \frac{1}{x}$, $x = \frac{1}{t}$

6) $\lim_{x\to 0} x\cot x = (0,\infty) \Rightarrow \lim_{x\to 0} \frac{x}{\tan x} = 1$

$\lim_{x\to 0} x\csc x = \lim_{x\to 0} \frac{x}{\sin x} = 1$

7) $\lim_{x\to(2\pi)^-} x\csc x = \lim_{x\to(2\pi)^-} \frac{x}{\sin x} = \frac{2\pi}{0} = -\infty$

$\lim_{x\to(\pi)^-} \csc x = \lim_{x\to(\pi)^-} \frac{1}{\sin x} = \frac{1}{0^+} = \infty$

$\lim_{x\to(-\frac{\pi}{2})^-} \sec x = \lim_{x\to(-\frac{\pi}{2})^-} \frac{1}{\cos x} = \frac{1}{0} = -\infty$

$\lim_{x\to 0} \frac{\sin x}{x} = 1$

$\lim_{x\to\infty} \frac{\sin x}{x} = 0$

$\lim_{x\to 0} x \sin\frac{1}{x} = 0$

(٤)

(شرح استخدام طريقة L·H)

(4)

$$\lim_{x\to a}\frac{f(x)}{g(x)}=\frac{0}{0}\xrightarrow{L\cdot H}\lim_{x\to a}\frac{f'(x)}{g'(x)}$$

(بالتعويض المباشر) ← (بالمكرر)

اشتقاق البسط : اشتقاق المقام

Ex: Evaluate the limit, if it exists. (التعويض المباشر أولاً دائماً)

1) $\lim_{t\to 0}\left(\frac{1}{t}-\frac{1}{t^2+t}\right)=\frac{1}{0}-\frac{1}{0}=(\infty-\infty)$ عير معرفة $=\lim_{t\to 0}\left(\frac{1}{t}-\frac{1}{t(t+1)}\right)$ توحيد المقام

$=\lim_{t\to 0}\left(\frac{(t+1)-1}{t(t+1)}\right)=\lim_{t\to 0}\frac{t}{t(t+1)}=\lim_{t\to 0}\frac{1}{t+1}=1$

2) $\lim_{x\to -1}\frac{2x^2+3x+1}{x^2-2x-3}=\frac{0}{0}\lim_{x\to -1}\frac{(2x+1)(x+1)}{(x-3)(x+1)}=\lim_{x\to -1}\frac{2x+1}{(x-3)}=\frac{-1}{-4}$

3) $\lim_{x\to -2}\frac{x+2}{x^3+8}=\frac{0}{0}\lim_{x\to -2}\frac{(x+2)}{(x+2)(x^2-2x+4)}=\frac{1}{12}$

4) $\lim_{x\to 2}\sqrt{\frac{2x^2+1}{3x-2}}=\sqrt{\frac{2(2)^2+1}{3(2)-2}}=\sqrt{\frac{9}{4}}=\frac{3}{2}$ (تعويض مباشر)

5) $\lim_{x\to 2}\frac{\sqrt{6-x}-2}{\sqrt{3-x}-1}=\frac{0}{0}\to\lim_{x\to 2}\frac{\sqrt{3-x}+1}{\sqrt{6-x}+2}=\frac{2}{4}=\frac{1}{2}$

6) $\lim_{x\to -2}(3x^2+ax+a+3)=0$, then $a=$ ---$\Leftrightarrow$ (عوض بقيمة x)

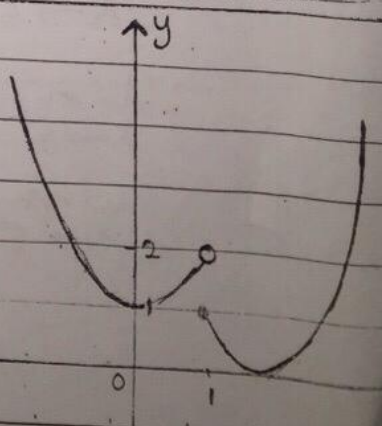
$3(-2)^2+a(-2)+a+3=0\to -2a+a=-15\Rightarrow\therefore a=15$

7) $f(x)=\begin{cases}x^2+1 & \text{if } x<1\\ (x-2)^2 & \text{if } x\geq 1\end{cases}$

$\lim_{x\to 1^-}(x^2+1)=2$

$\lim_{x\to 1^+}(x-2)^2=1$

$\Rightarrow\therefore\lim_{x\to 1}f(x)=D.N.E$



8) $\lim_{x\to 3} \frac{x^2-3x-1}{|x-4|} = \frac{9-9-1}{|-1|} = \frac{-1}{1} = -1$ (تعويض مباشر)

$D_f = \mathbb{R} - \{4\}$, $x = 3 \in D_f$

9) $\lim_{x\to 4} \frac{4-x}{2-\sqrt{x}} = \frac{0}{0}$ $\lim_{x\to 4} \frac{(2-\sqrt{x})(2+\sqrt{x})}{(2-\sqrt{x})}$

$= \lim_{x\to 4} (2+\sqrt{x}) = 2+\sqrt{4} = 2+2 = 4$

10) If $\lim_{x\to a^-} f(x) = -\infty$ and $\lim_{x\to a^+} f(x) = \infty$, then $\lim_{x\to a} f(x) = D.N.E$

Ex: Evaluate the limit :

1) $\lim_{x\to 2} (3x^2+x-4) = 3(2)^2+2-4 = 10$ كثيرة حدود ← تعويض مباشر $D = \mathbb{R}$

2) $\lim_{x\to 2} \frac{x^3+5}{x^2+1} = \frac{(2)^3+5}{(2)^2+1} = \frac{8+5}{4+1} = \frac{13}{5}$ دالة عقلية تعويض مباشر أولاً (المقام مجموع مربعين : $D=\mathbb{R}$)

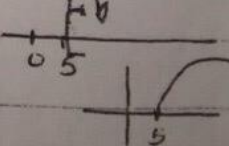
3) $\lim_{x\to -1} \sqrt{x^3+6} = \sqrt{-1+6} = \sqrt{5}$ تعويض مباشر ← جذر تربيعي ودليل الجذر عدد $x > -1$ أي ليس صفر المقام

4) $\lim_{x\to -1} \frac{1}{x-1} = \frac{1}{-1-1} = -\frac{1}{2}$ ($D = \mathbb{R} - \{1\}$ التعويض المباشر $x = -1$ ليس صفر المقام)

5) $\lim_{x\to 5} \sqrt{x-5} = D.N.E$ $D_f = [5, \infty)$ نجد المجال أولاً : (الدالة معرفة على يمين 5)

$\because \lim_{x\to 5^+} \sqrt{x-5} = 0$ ($\lim_{x\to 9} \sqrt{x-5} = \sqrt{4} = 2$ ندرس النهاية من اليمين

$\lim_{x\to 5^-} \sqrt{x-5} = D.N.E$ ($\lim_{x\to -4} \sqrt{x-5} = D.N.E$



57) $\lim_{x\to 1} \frac{f(x)-8}{x-1} = 10$ find $\lim_{x\to 1} f(x)$ (13)

$\Rightarrow f(x) - 8 = 10(x-1) \Rightarrow f(x) - 8 = 10x - 10$

$\Rightarrow f(x) = 10x - 10 + 8 \Rightarrow f(x) = 10x - 2$

$\therefore \lim_{x\to 1} f(x) = \lim_{x\to 1} (10x-2) = 10 - 2 = 8$

58) If $\lim_{x\to 0} \frac{f_1(x)}{x^2} = 5$ find a) $\lim_{x\to 0} f(x)$ b) $\lim_{x\to 0} \frac{f(x)}{x}$

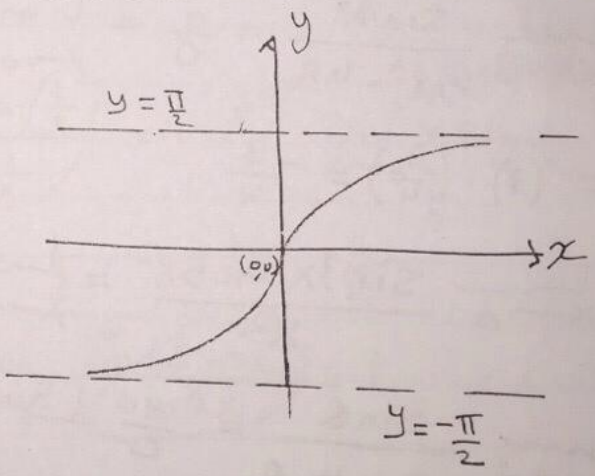
a) $\lim_{x\to 0} f(x) = 5 \lim_{x\to 0} x^2 = 5(0) = 0$

b) $\lim_{x\to 0} \frac{f(x)}{x} = 0 \longrightarrow \lim_{x\to 0} f(x) = \lim_{x\to 0} x = 0$

Note: ص 132

1) $\lim_{x\to -\infty} \tan^{-1} x = -\frac{\pi}{2}$

2) $\lim_{x\to \infty} \tan^{-1} x = \frac{\pi}{2}$



EX: أكتب أدرس: Find (H.A)

1) $\lim_{x\to \infty} \frac{2}{\tan^{-1} x} = \frac{2}{\tan^{-1}(\infty)} = \frac{2}{\frac{\pi}{2}} = \frac{4}{\pi}$

2) $\lim_{x\to -\infty} \frac{2}{\tan^{-1} x} = \frac{2}{\tan^{-1}(-\infty)} = \frac{2}{-\frac{\pi}{2}} = \frac{-4}{\pi}$

$$\lim_{x \to -\infty} \frac{e^{-x} + 2}{x^2 + 1} = \frac{\infty}{\infty}$$ تعويض مباشر

$$\xrightarrow{L.H} \lim_{x \to -\infty} \frac{-e^{-x}}{2x} = \frac{-\infty}{\infty}$$

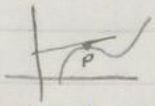
$$e^{-(-\infty)} = e^{\infty} = \infty$$

$$\xrightarrow{L.H} \lim_{x \to -\infty} \frac{e^{-x}}{2} = \infty$$

(chapter 2.7) Derivatives & Rate of change

Def: ص 143

The tangent Line to the curve $y=f(x)$ at the point $P(a,f(a))$ is the Line through P with slope



(ميل المماس)

1 $$m = \lim_{x \to a} \frac{f(x)-f(a)}{x-a}$$ provided that this Limit exists

Def: ص 144

let $h=(x-a) \longrightarrow \therefore x=(a+h)$ نستبدل في التعريف السابق لنحصل على الصيغة الجديدة للميل

2

(ميل المماس): $$m = \lim_{h \to 0} \frac{f(a+h)-f(a)}{h}$$ (slope of the tangent Line)

Def: ص 145

The derivative of a function f at a number a (denoted by $f'(a)$), is

3 $$f'(a) = \lim_{h \to 0} \frac{f(a+h)-f(a)}{h}$$ if this Limit exists.

$\therefore$ صيغة ايجاد ميل المماس m رقم 2 = صيغة الشكل الاولي ورقم 3 عند العدد a

Def: ص 146

let $h=(x-a) \longrightarrow \therefore x=(a+h)$ ($\therefore$ the derivative of f

4 $$f'(a) = \lim_{x \to a} \frac{f(x)-f(a)}{x-a}$$

: صيغة ايجاد ميل المماس m رقم 1 = صيغة الشكل الاولي رقم 4 .

Def: How to the equation of the tangent Line:

1) Find the slope $m = f'(x)$ 1) نوجد مشتقة الاقتران $f(x)$
2) use (x_0,y_0) to find value of $m|_{x=a}$ 2) نوجد نقطة على الاقتران (x_0,y_0)
3) معادلة الخط المستقيم

3) $(y-y_0) = m(x-x_0) \Longrightarrow \therefore y = mx+b$ (1)

or $Ax+By+C=0$ (2) معادلة وضع معادلة المستقيم على صورة (1) او (2)

chapter (2.7)

Ex 1 ص 144

Find an equation of the tangent line of $f(x)=x^2$, $P(1,1)$

1) $f'(x)=2x \longrightarrow \therefore m=f'(x)\Big|_{x=1}=2(1)=2$ (الميل)

2) the equation of the tangent line:

$(y-y_0)=m(x-x_0) \Rightarrow (y-1)=2(x-1)$

$\Rightarrow y-1=2x-2 \Rightarrow y=2x-1$

Ex 2: Find an equation of the tangent line of $f(x)=\frac{3}{x}$, $P(3,1)$

1) $f'(x)=\frac{(-1)(3)}{x^2}=\frac{-3}{x^2}=m$ الميل

$\therefore m=f'(x)\Big|_{x=3}=\frac{-3}{9}=\frac{-1}{3}$

2) $(y-y_0)=m(x-x_0) \Rightarrow (y-1)=\frac{-1}{3}(x-3)$

$\Rightarrow y-1=-\frac{1}{3}x+1 \Rightarrow y=\frac{-1}{3}x+2$ (الضرب في 3)

$\rightarrow 3y=-x+6 \Rightarrow \therefore x+3y-6=0 \xrightarrow[\text{صورة}]{} Ax+By+C=0$

Ex 4: ص 146

$f(x)=x^2-8x+9$, Find $f'(a)$ (استخدام التعريف)

(3) نقم /

$$f'(a)=\lim_{h\to 0}\frac{f(a+h)-f(a)}{h}=\lim_{h\to 0}\frac{[(a+h)^2-8(a+h)+9]-[a^2-8a+9]}{h}$$

Ex 5: Find an equation of the tangent line, $f(x)=x^2-8x+9$ at $(3,-6)$

1) $f'(x)=2x-8\Big|_{x=3}=2(3)-8=-2=m$ (الميل) slope

2) $(y-y_0)=m(x-x_0) \Rightarrow (y+6)=-2(x-3)$

$\Rightarrow y+6=-2x+6 \Rightarrow y=-2x$

(chaptir 2.8) The Derivative as a function

Def 1:

The derivative of a function f at a number a :

$$f'(a) = \lim_{h \to 0} \frac{f(a+h) - f(a)}{h} \qquad (1)$$

Def : 2:

The derivative of a function f for variable x :

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} \qquad (2)$$

Ex: ص56 If $f(x) = \sqrt{x}$, find f', D_f , $D_{f'}$

1) $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} \frac{\sqrt{x+h} - \sqrt{x}}{h}$

2) $D_f = [0, \infty)$, $D_{f'} = (0, \infty)$ $f'(x) = \frac{1}{2\sqrt{x}}$ (باستخدام القانون)

Ex: $f(x) = \frac{1-x}{2+x}$ Find $f'(x)$ (باستخدام التعريف)

1) $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \to 0} \left[\frac{\frac{1-(x+h)}{2+(x+h)} - \frac{(1-x)}{(2+x)}}{h} \right]$

2) $f'(x) = \frac{(-1)(2+x) - (1)(1-x)}{(2+x)^2} = \frac{-2-x-1+x}{(2+x)^2} = \frac{-3}{(2+x)^2}$

⊛ Other Notations:

1) $f'(x) = y' = \frac{dy}{dx} = \frac{df}{dx} = \frac{d}{dx} f(x) = Df(x) = D_x f(x)$

⊛ Higher Derivatives:

2) $f''(x) = y'' = \frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right) \ldots$

3) $y^{(n)} = f^{(n)}(x) = \frac{d^n y}{dx^n}$

4) $\left.\frac{dy}{dx}\right|_{x=a}$ (اي المشتقة بقيمة x)

* The tangent line to $y=f(x)$ at $(a, f(a))$ is the line through $(a, f(a))$ whose slope is equal to $f'(a)$, the derivative of f at a

معادلة المماس عند النقطة $(a, f(a))$

$$\boxed{(y-f(a)) = f'(a)(x-a)}$$

الخط المستقيم المماس لمنحنى $f(x)$ عند النقطة $(a,f(a))$ وميله $m = f'(a)$ هي المشتقة الأولى للدالة f عند النقطة a

---

Ex5: ص157

where is the function $f(x) = |x|$ differentiable?

1) f is not diff. at $x=0$ (عند الصفر)

2) f is diff. at $x>0$ and $x<0$ → or $\mathbb{R}-\{0\}$

3) $f'(x) = \begin{cases} 1 & \text{if } x>0 \\ -1 & \text{if } x<0 \end{cases}$ $\Rightarrow \because \lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = D.N.E$

استخدام التعريف $f'(x)$

Note:

1) $|x \pm a|$ → is not diff. at $x = \pm a$ (غير قابلة للاشتقاق عند الصفر)

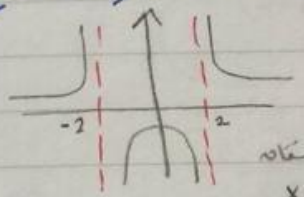
2) $\sqrt{x \pm a}$ → is not diff at $x = \pm a$ (غير قابلة للاشتقاق عند الصفر)

3) $y = \frac{f(x)}{g(x)}$ rational fun. → not diff. at $x = \pm a$ (V.A) غير قابلة للاشتقاق عند أصفار المقام

4) slope of (V. Line) = undefined ميل أي خط رأسي غير معرف وغير قابل للاشتقاق عند أي خط رأسي.

5) slope of (H. Line) = 0

6) $(a,b) \subseteq [a,b] \Rightarrow D_{f_1} \subseteq D_f$



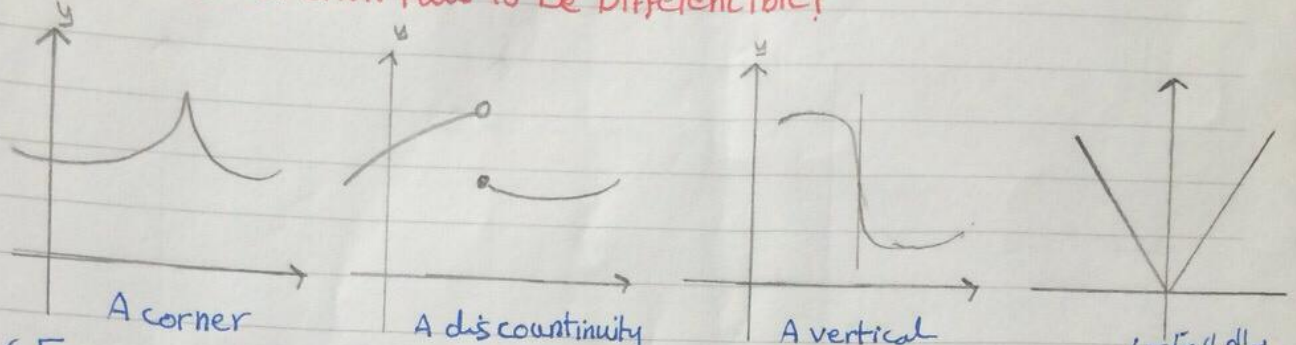
غير قابلة للاشتقاق عند $x = \pm 2$

Theorm: ص158

If f is differentiable at a, then f is continuous at a.

والعكس غير صحيح فمثال: دالة المقياس دالة متصلة عند نقطة الانكسار $x=a$ ولكنها غير قابلة للاشتقاق عند نقطة الانكسار (صفر المقياس).

How Can a Function Fail to Be Differentible?



(Four ways for f not be diff. at a)

Ex 7: ص 161

If $f(x) = x^3 - x$, Find $f''(x)$ and $f^{(4)}(x)$

1) $f'(x) = 3x^2 - 1$
2) $f''(x) = 6x$
3) $f'''(x) = 6 \longrightarrow \therefore f^{(4)} = 0$

اذا كانت درجة الدالة f هي n
وطلب المشتقة (n+1) للدالة
∴ الناتج = 0

Ex: Find the equation of the tangent line and normal line to the curve $y = x\sqrt{x}$ at $P(1,1)$. (3.1) موجود

1) the equation of the tangent line at (1,1):

a) $f'(x) = \sqrt{x} + \frac{x}{2\sqrt{x}} \Rightarrow f'(x)\Big|_{x=1} = 1 + \frac{1}{2} = \frac{3}{2} = m_1$ الميل

b) $(y-1) = \frac{3}{2}(x-1) \Rightarrow y = \frac{3}{2}x - \frac{3}{2} + 1 \Rightarrow \boxed{y = \frac{3}{2}x - \frac{1}{2}}$ (معادلة المماس)

2) The equation of normal line at (1,1):

a) $\because m_1 = \frac{3}{2} \longrightarrow \therefore m_2 = -\frac{2}{3}$ (ميل الخط العمودي)

b) $(y - y_0) = m_2(x - x_0) \Rightarrow (y-1) = -\frac{2}{3}(x-1) \Rightarrow$
$y - 1 = -\frac{2}{3}x + \frac{2}{3} \Rightarrow y = -\frac{2}{3}x + \frac{5}{3}$ (معادلة العمودي)

Ex: Find the points on the curve $y = x^4 - 6x^2 + 4$ where the tangent is horizontial

اي تحديد قيم x للمشتقة $f' = 0$ اي
where the slope $f'(x) = m = 0$

1) $y = x^4 - 6x^2 + 4$

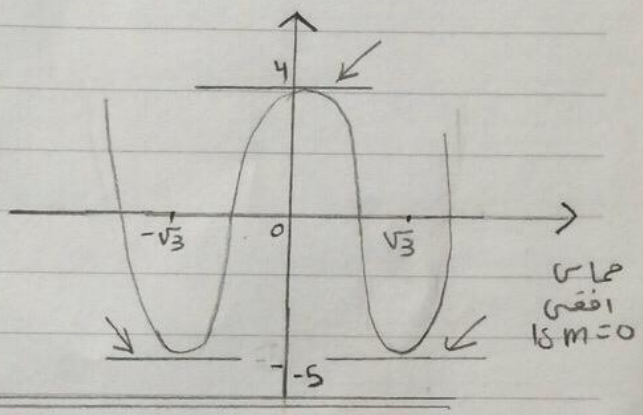
$y' = 4x^3 - 12x = 0$ (نأخذ المشتقة) $\Rightarrow 4x(x^2 - 3) = 0 \Rightarrow$

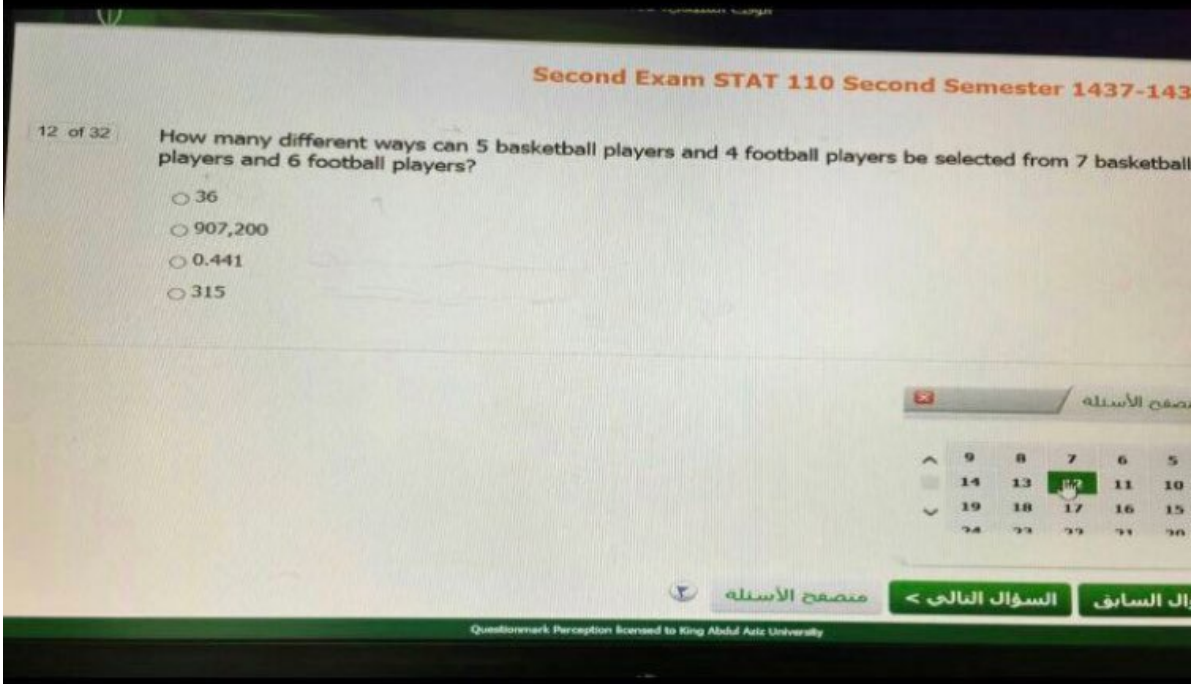
$4x(x - \sqrt{3})(x + \sqrt{3}) = 0 \Rightarrow \therefore x = 0 \, , \, x = \pm\sqrt{3}$

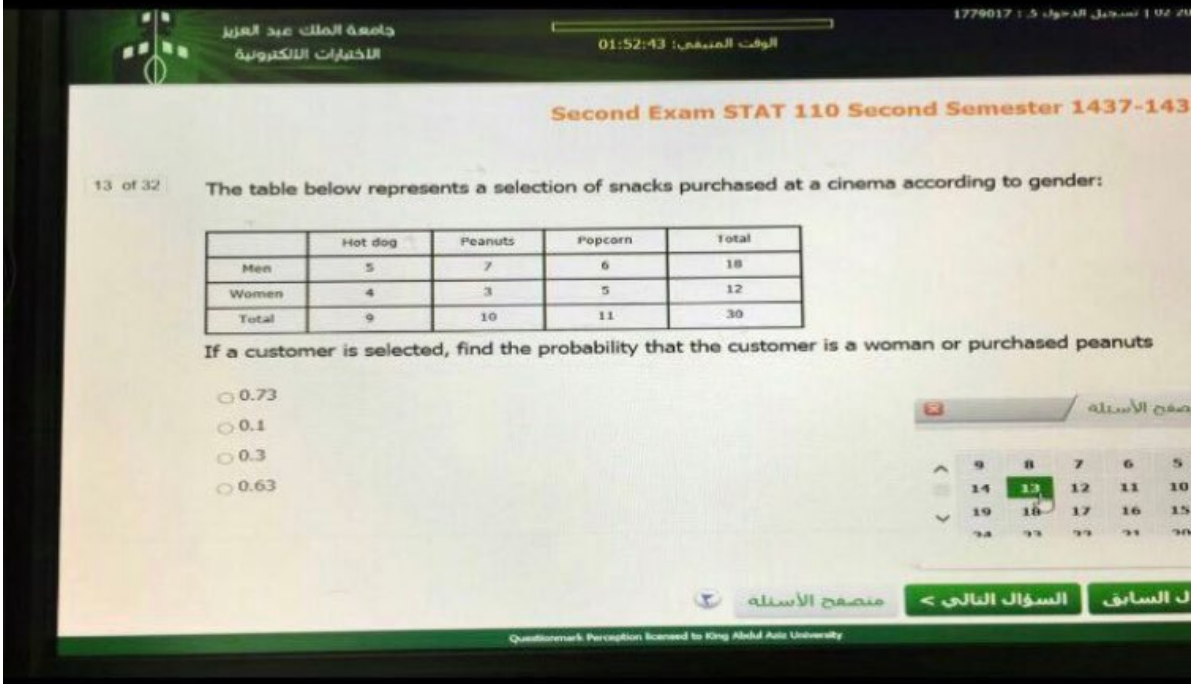
2) at $x = 0 \rightarrow y = 4 \rightarrow \therefore (0, 4)$

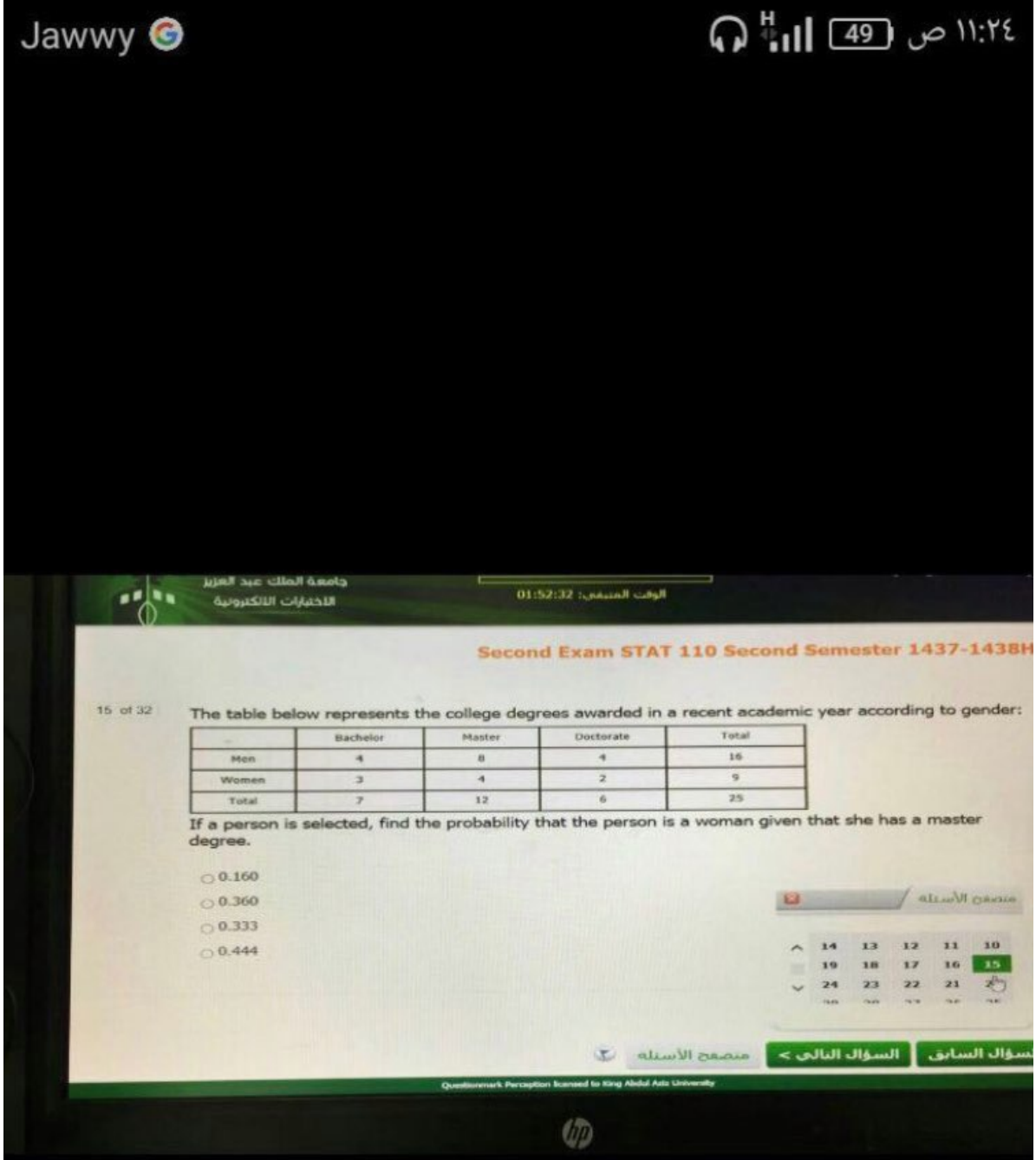
$x = \sqrt{3} \rightarrow y = -5 \rightarrow (\sqrt{3}, -5)$

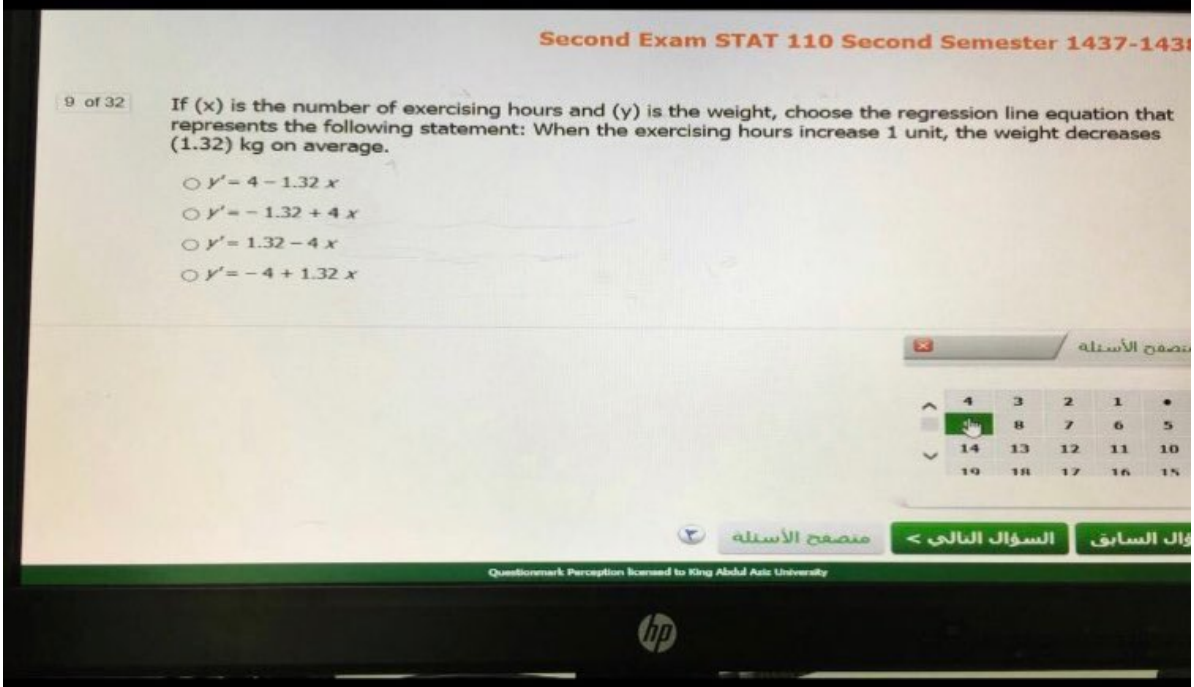
$x = -\sqrt{3} \rightarrow y = -5 \rightarrow (-\sqrt{3}, -5)$

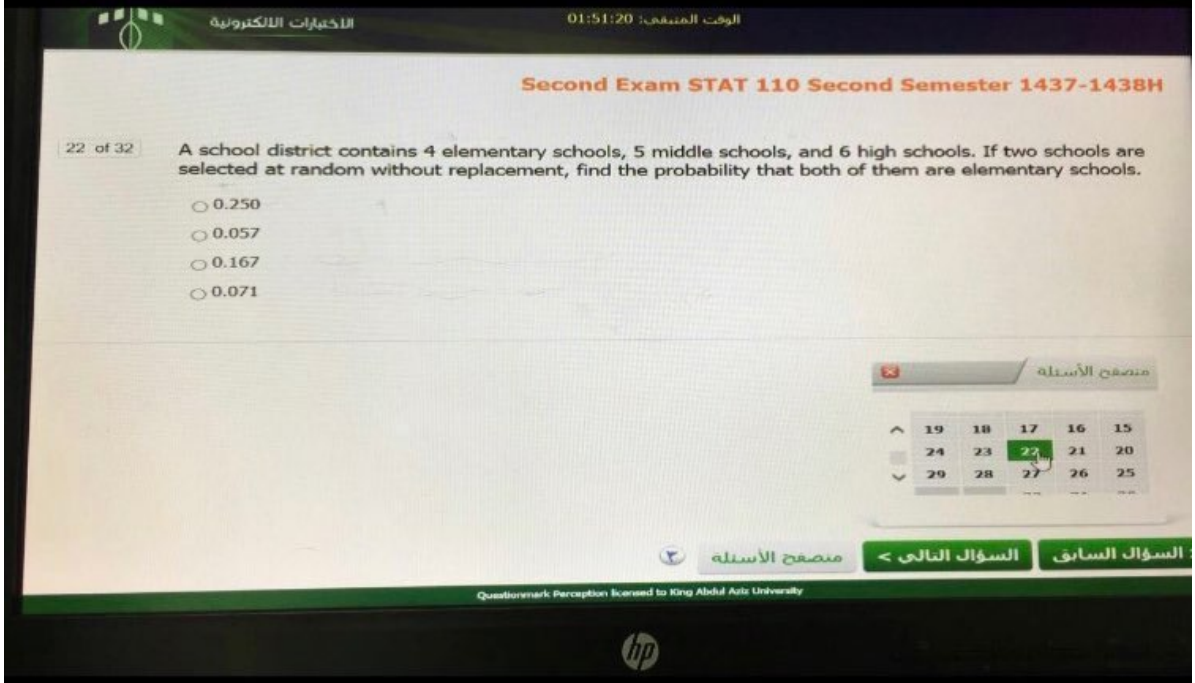


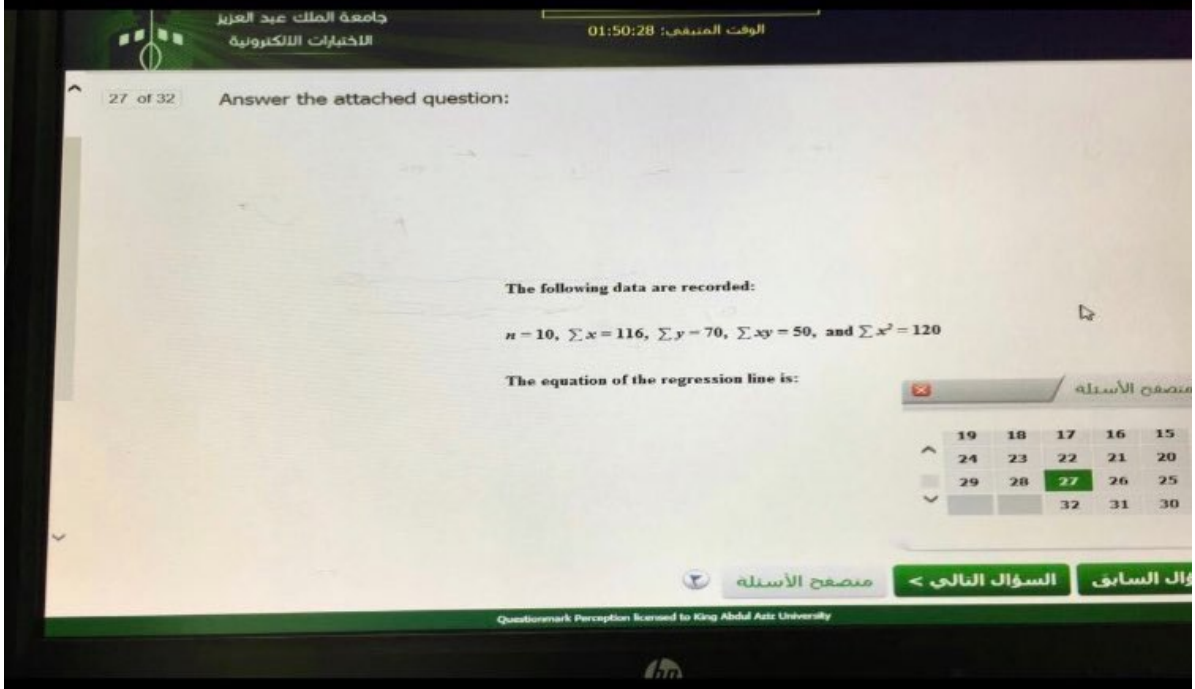


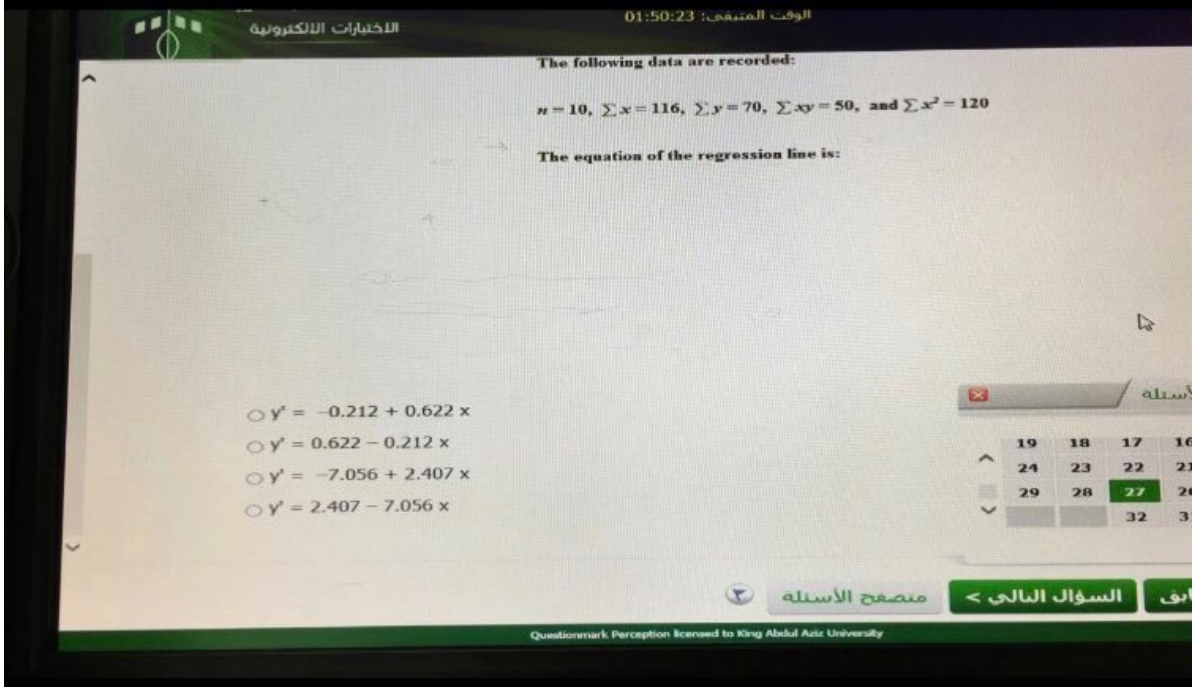


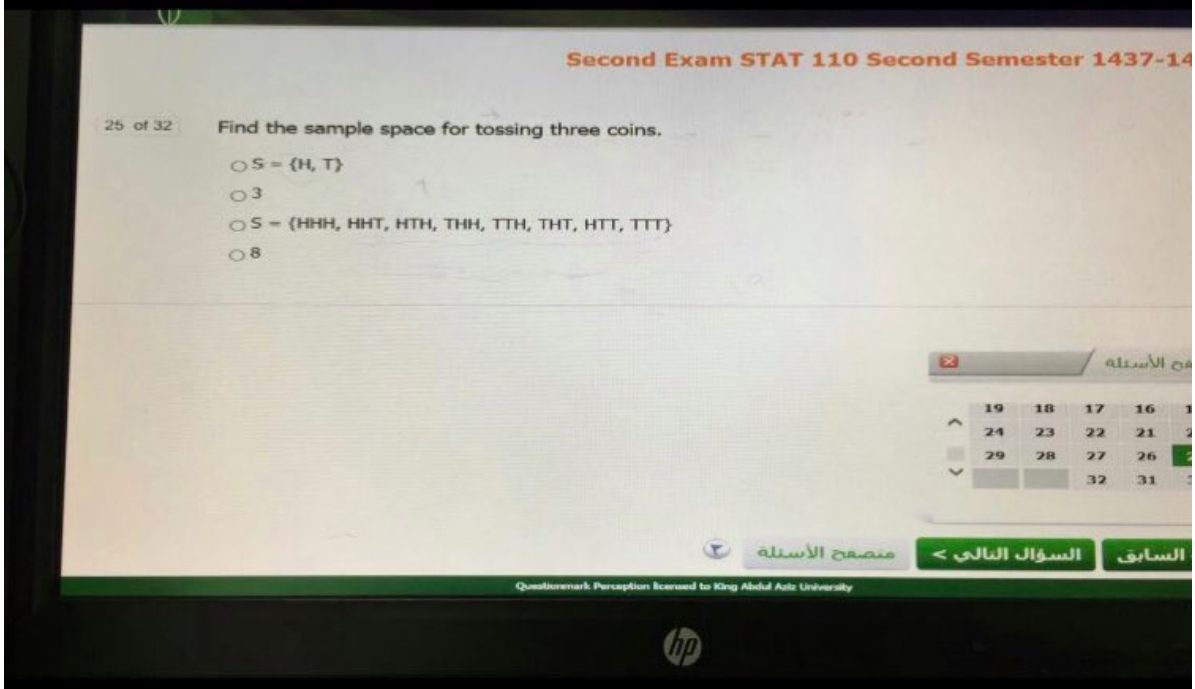


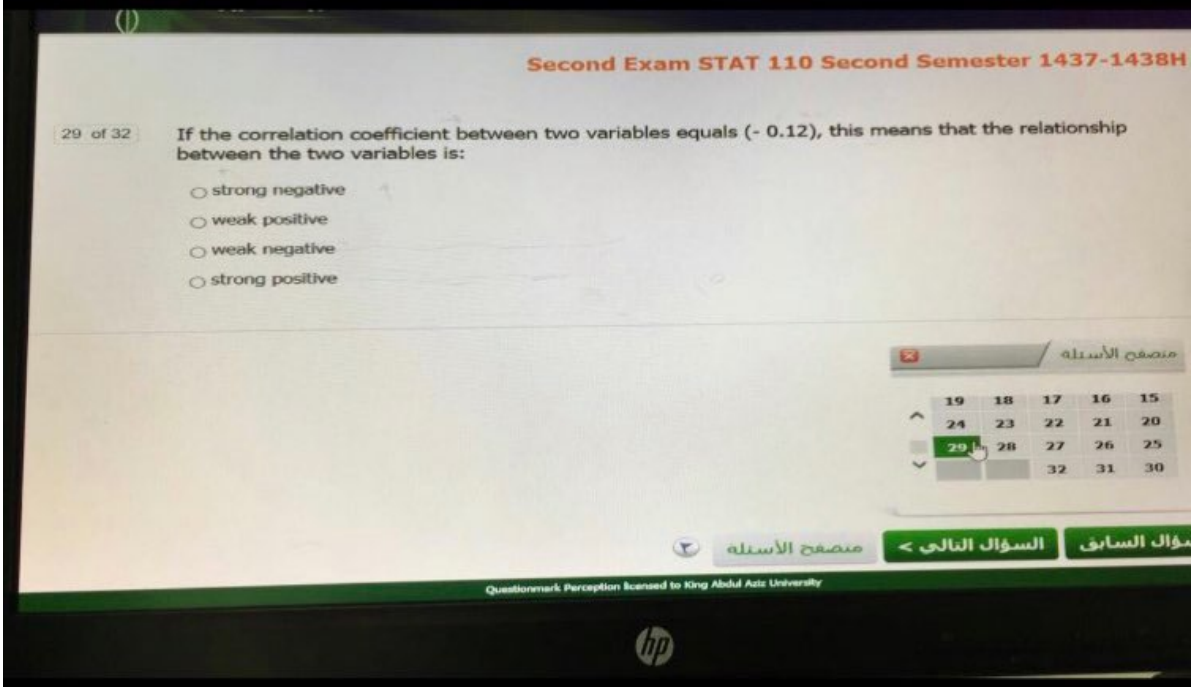


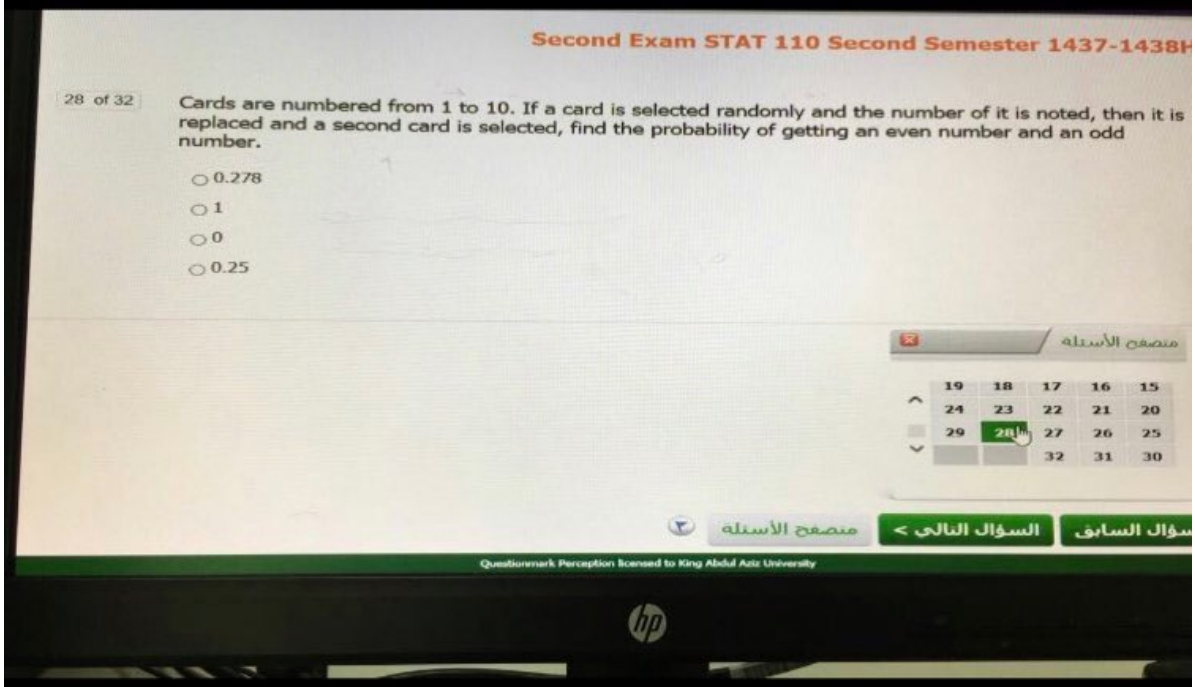


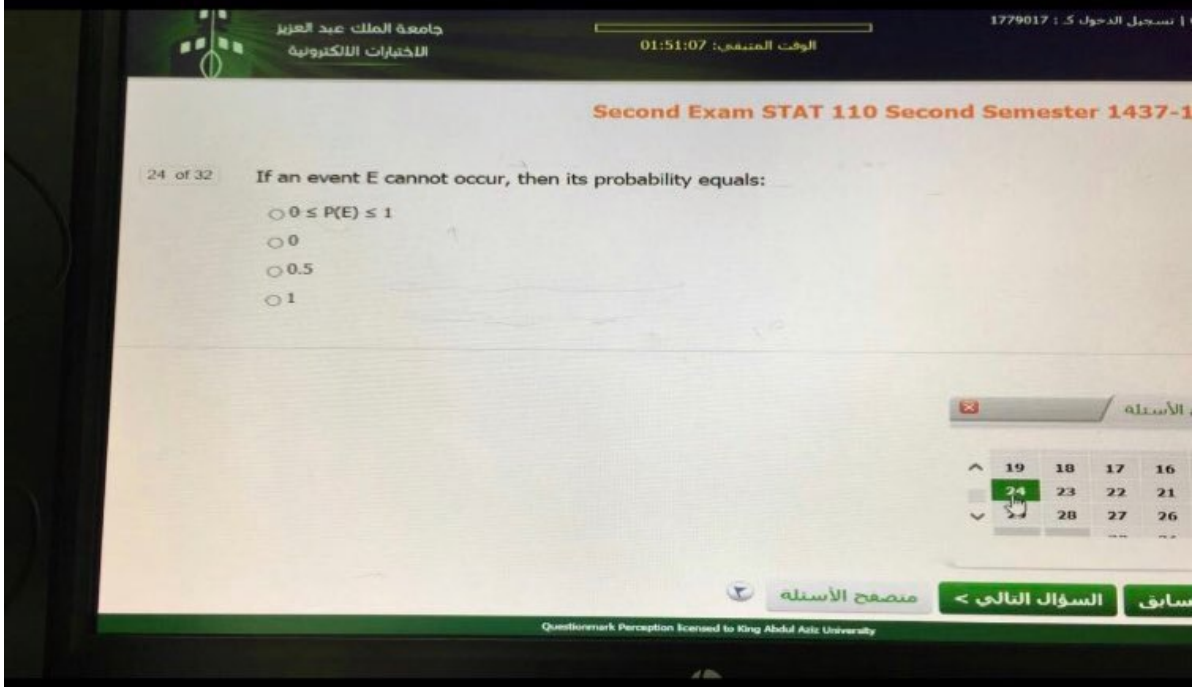


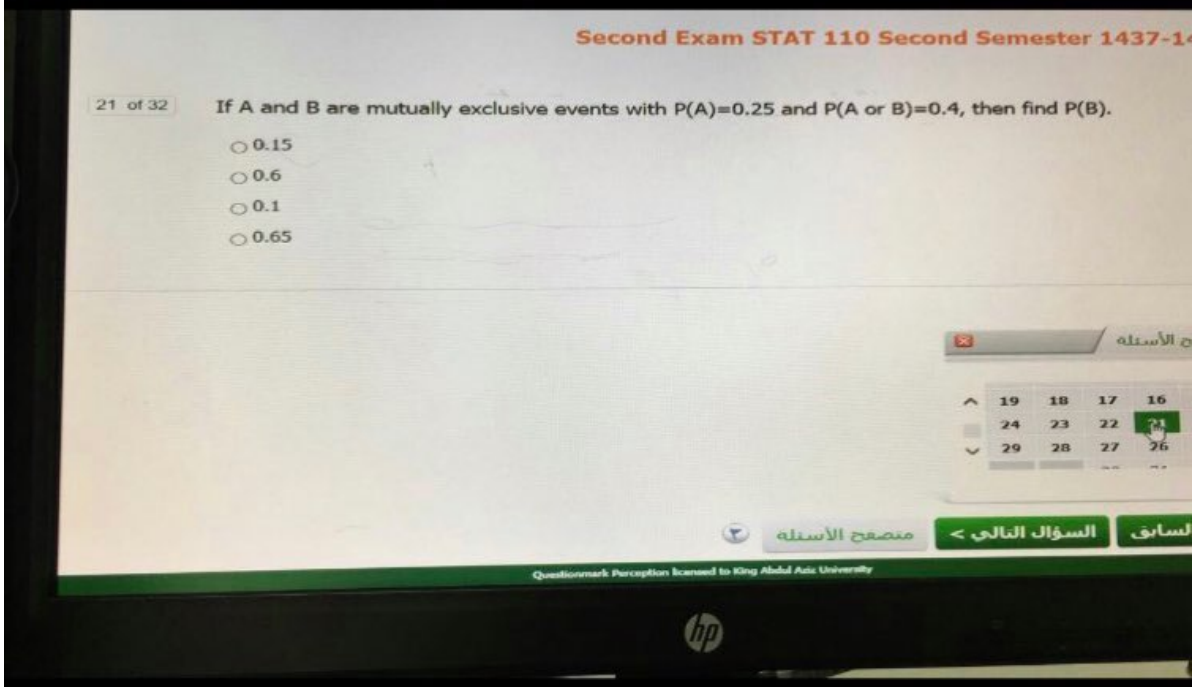


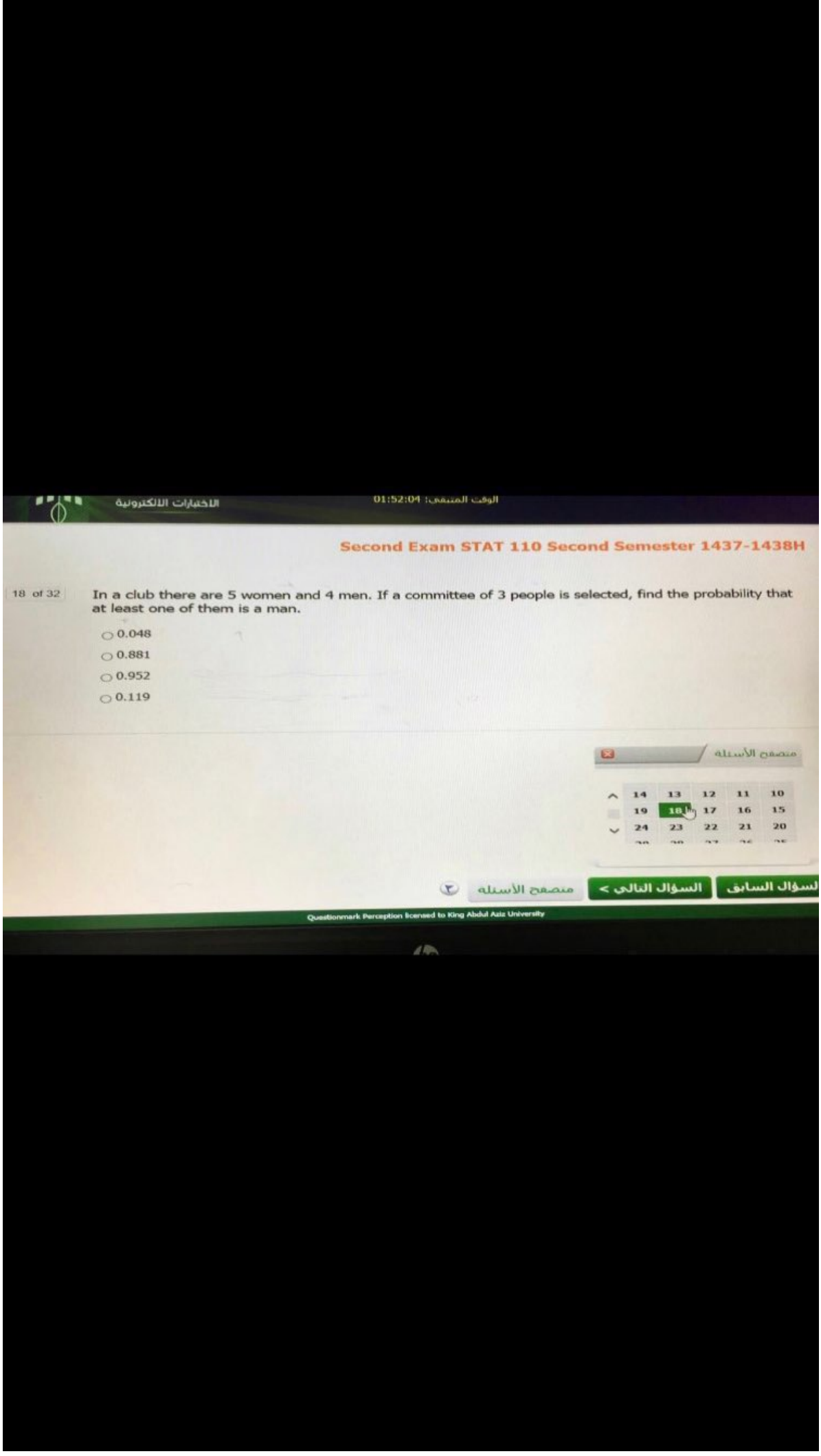


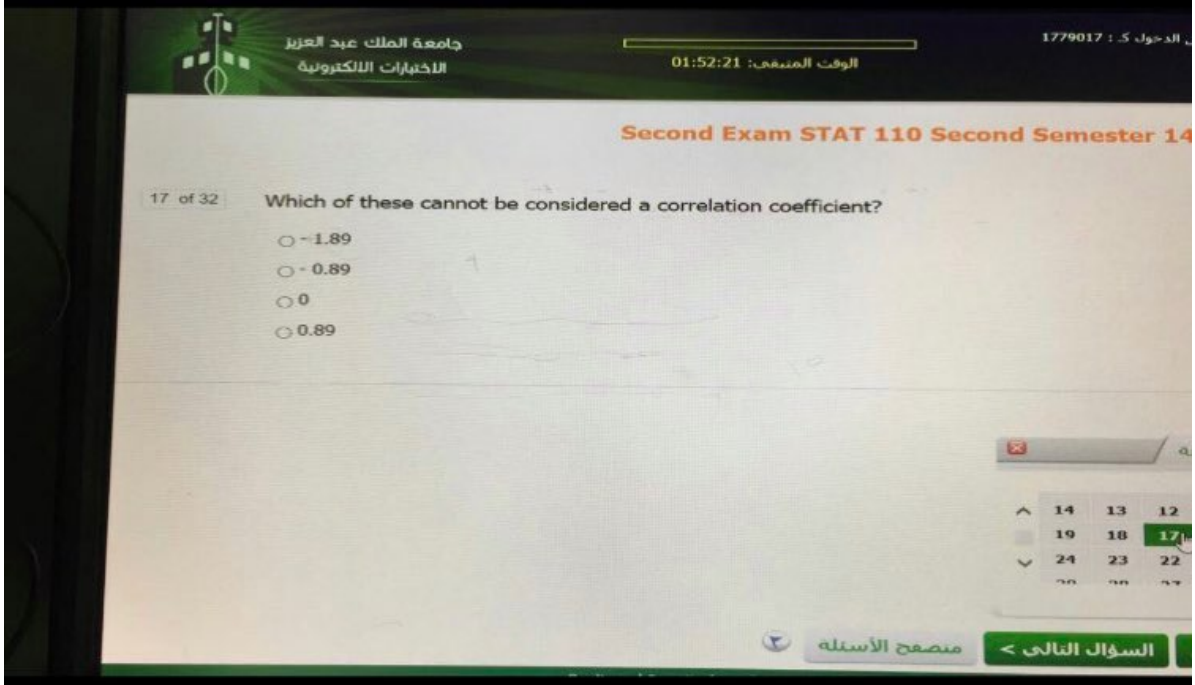


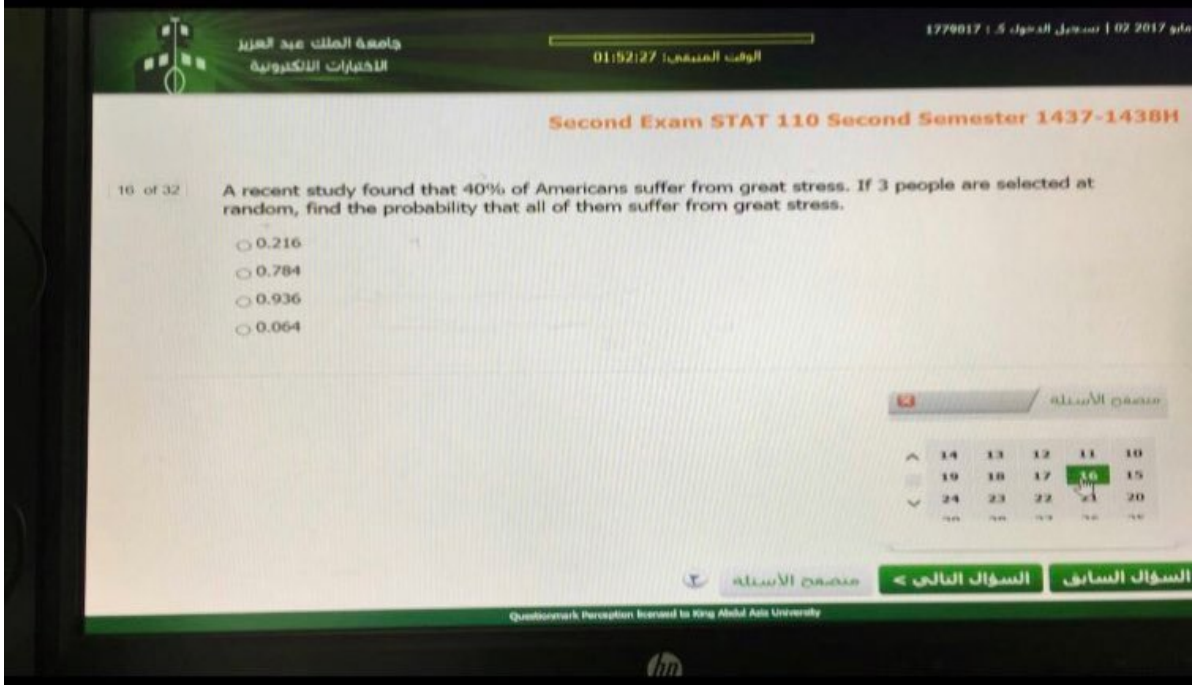


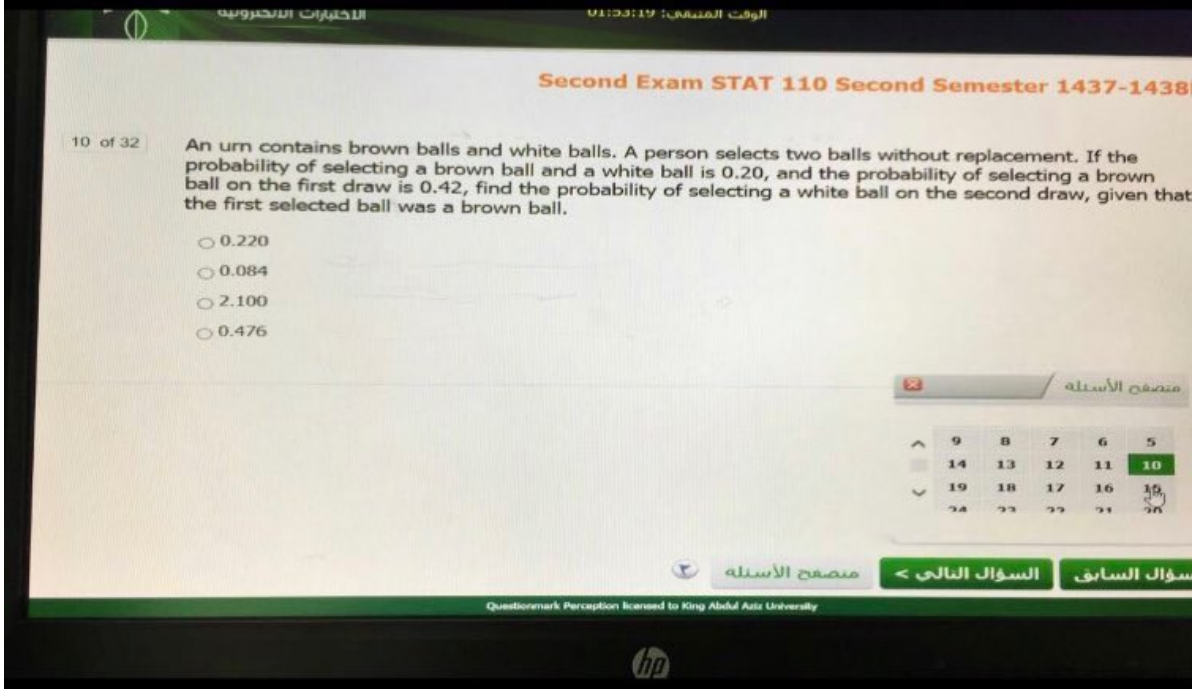


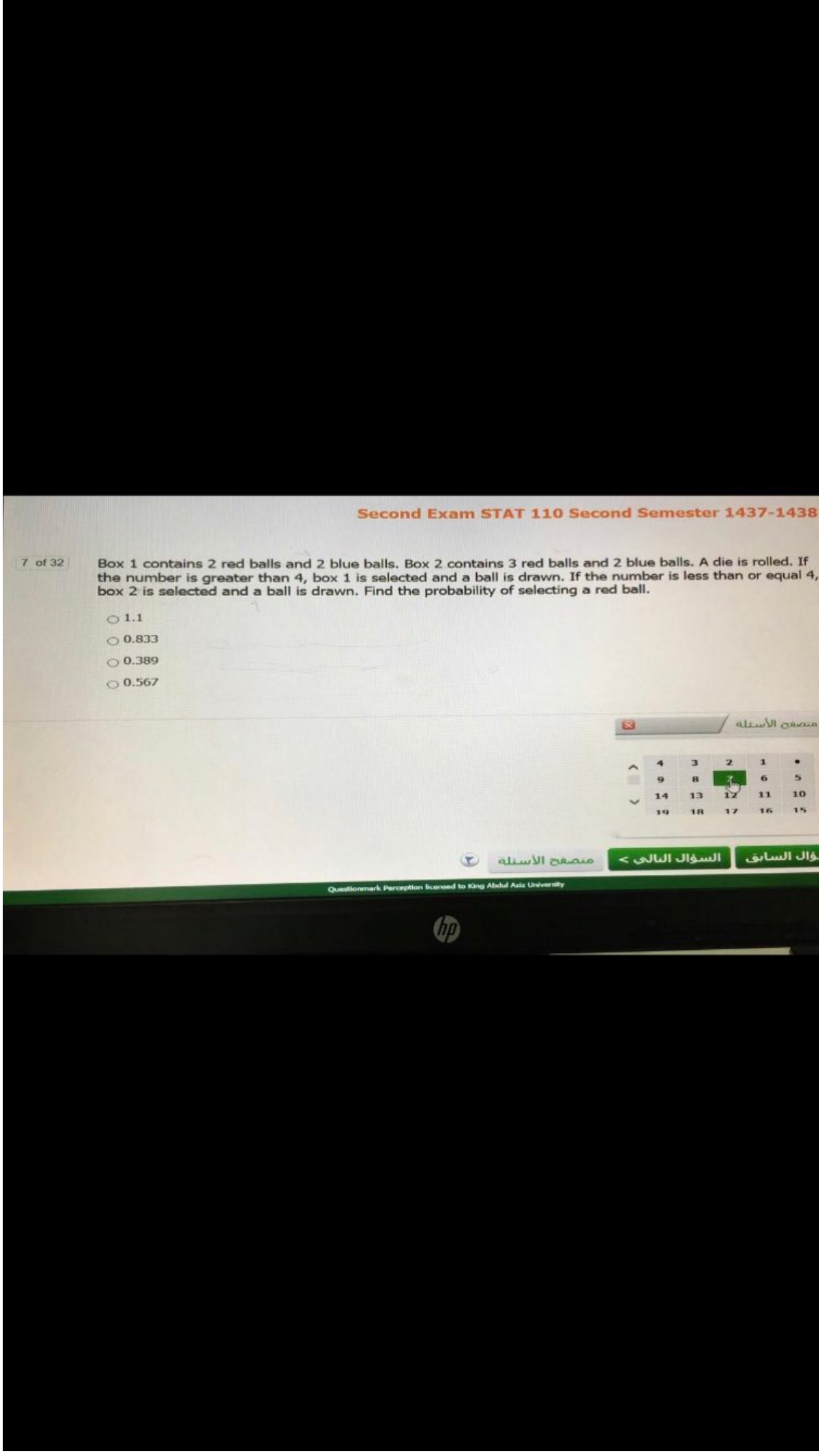


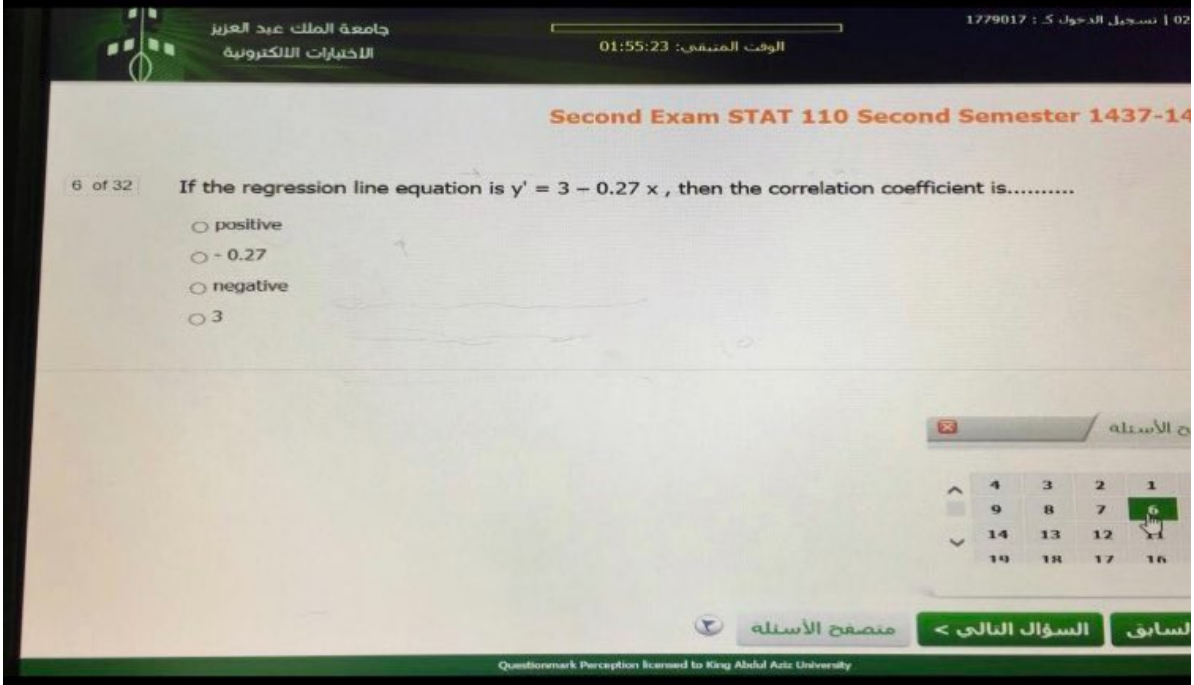


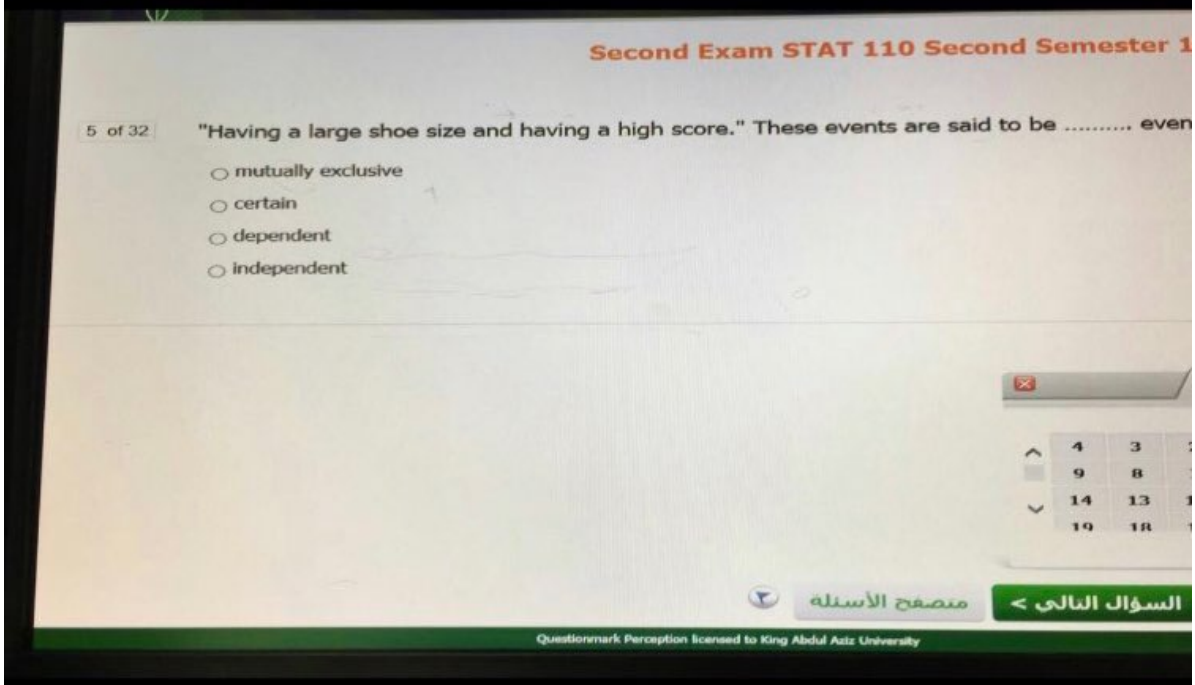


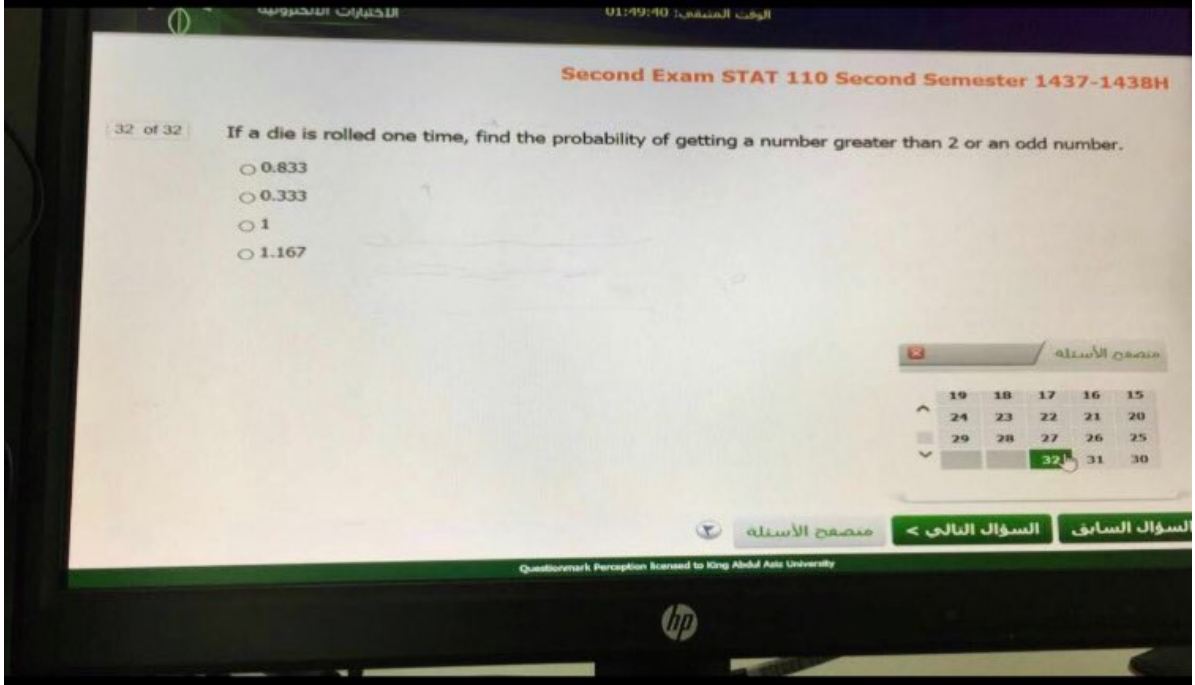


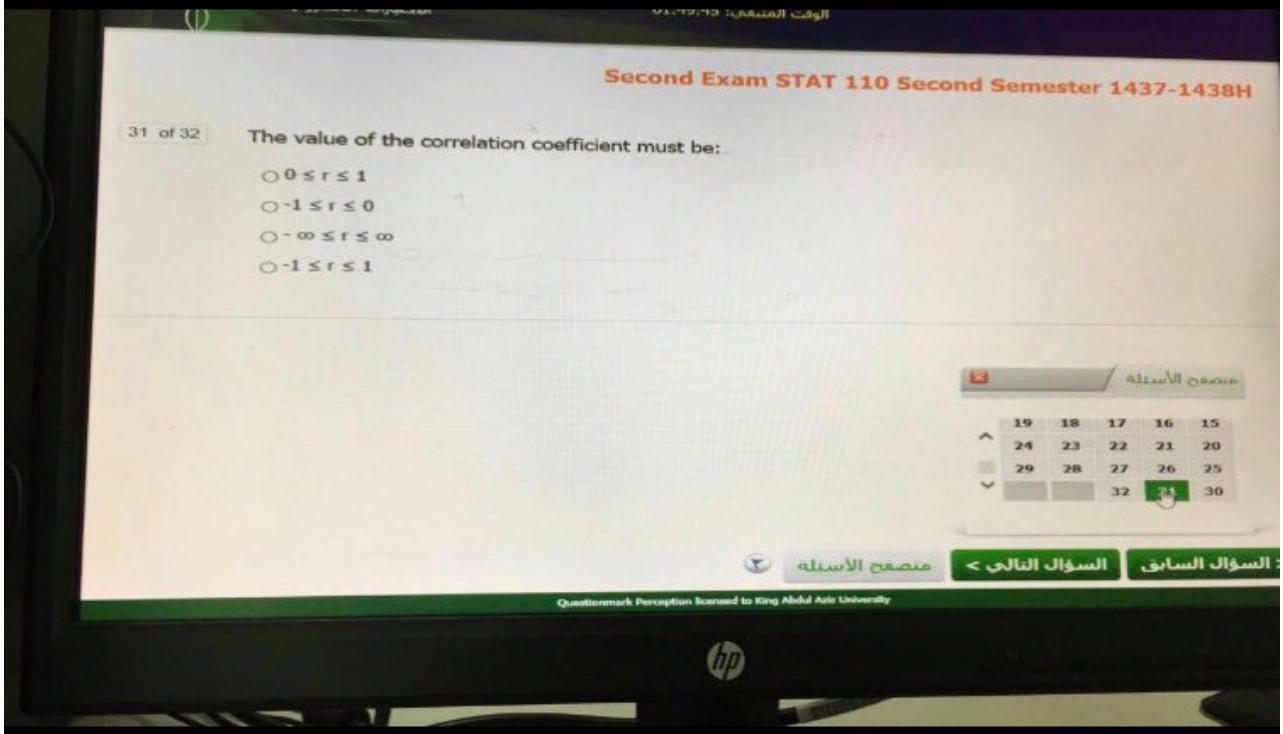


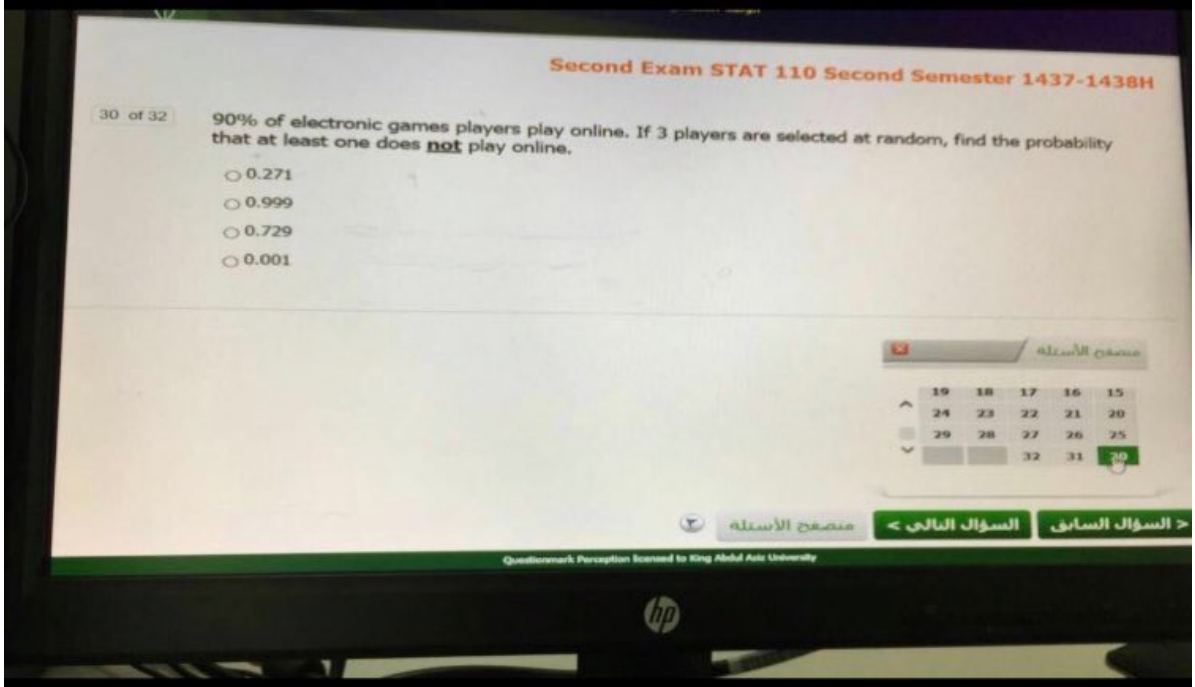


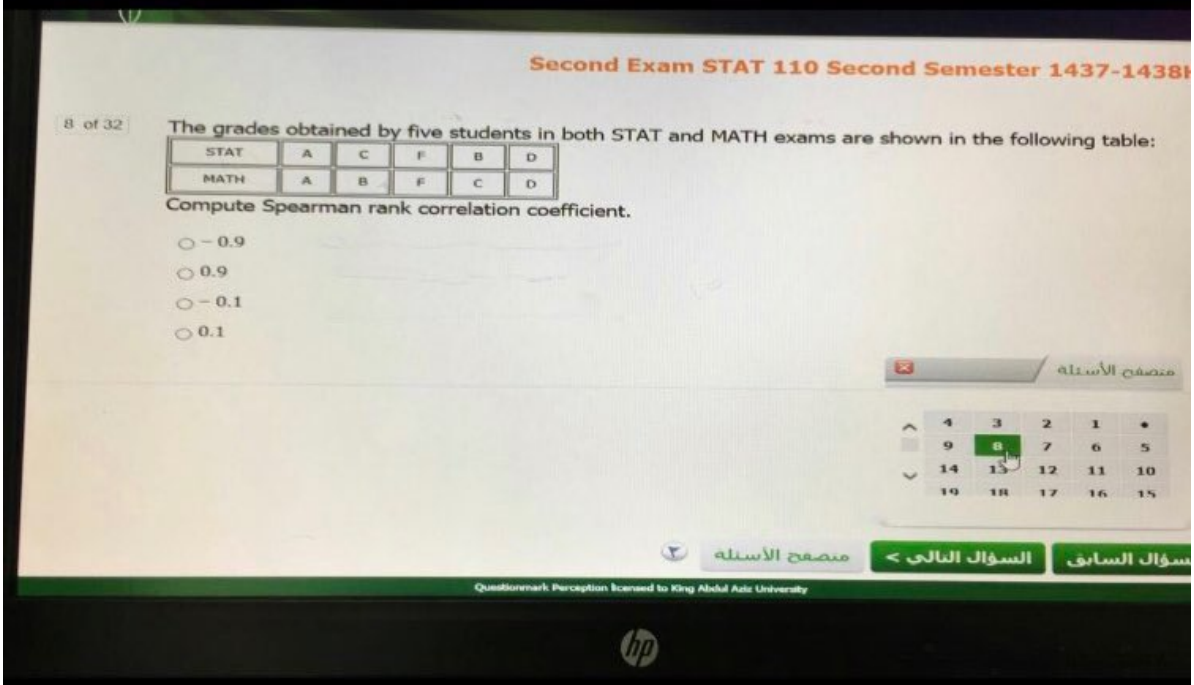


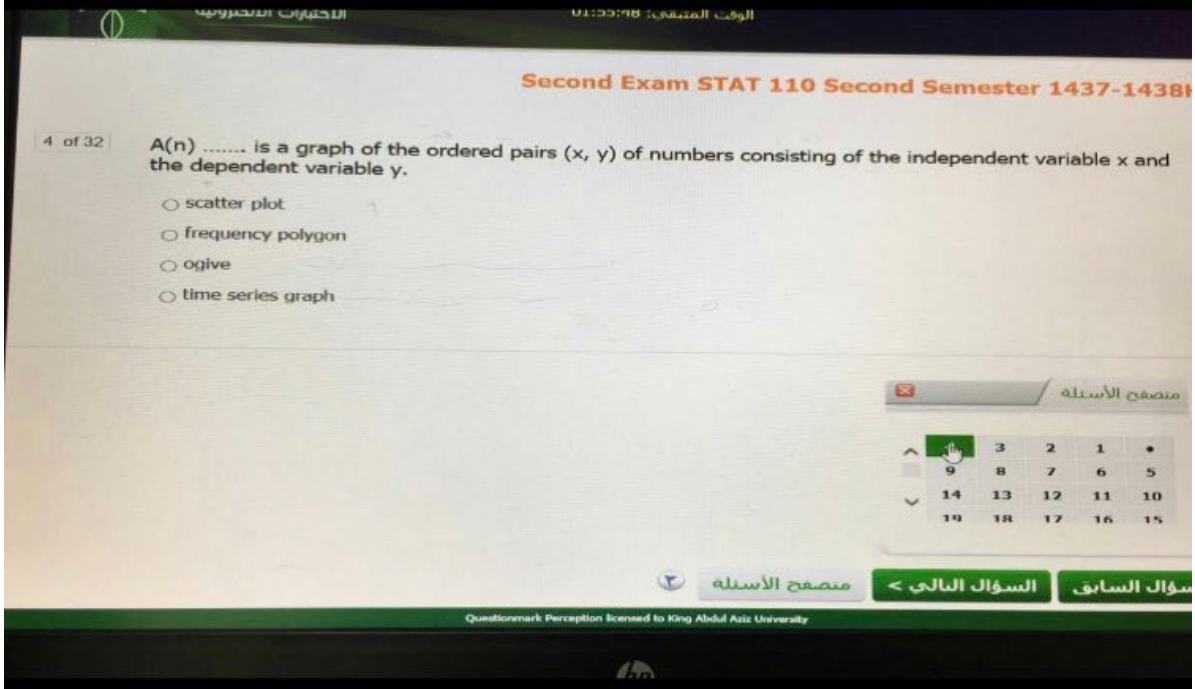


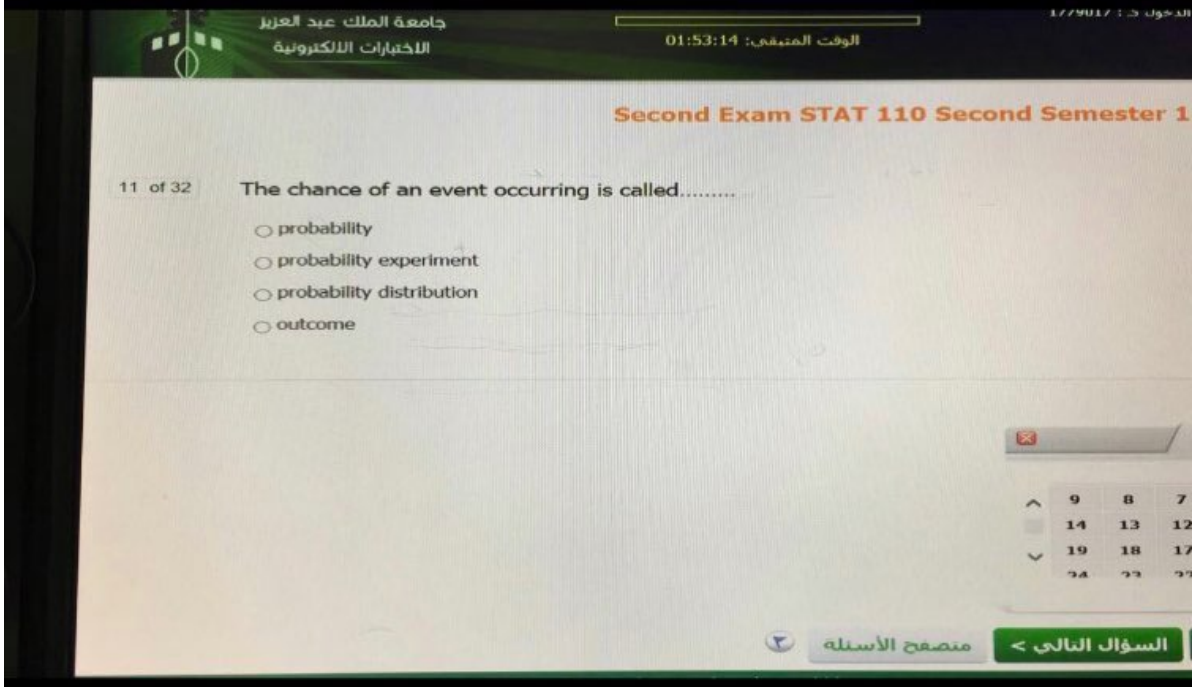


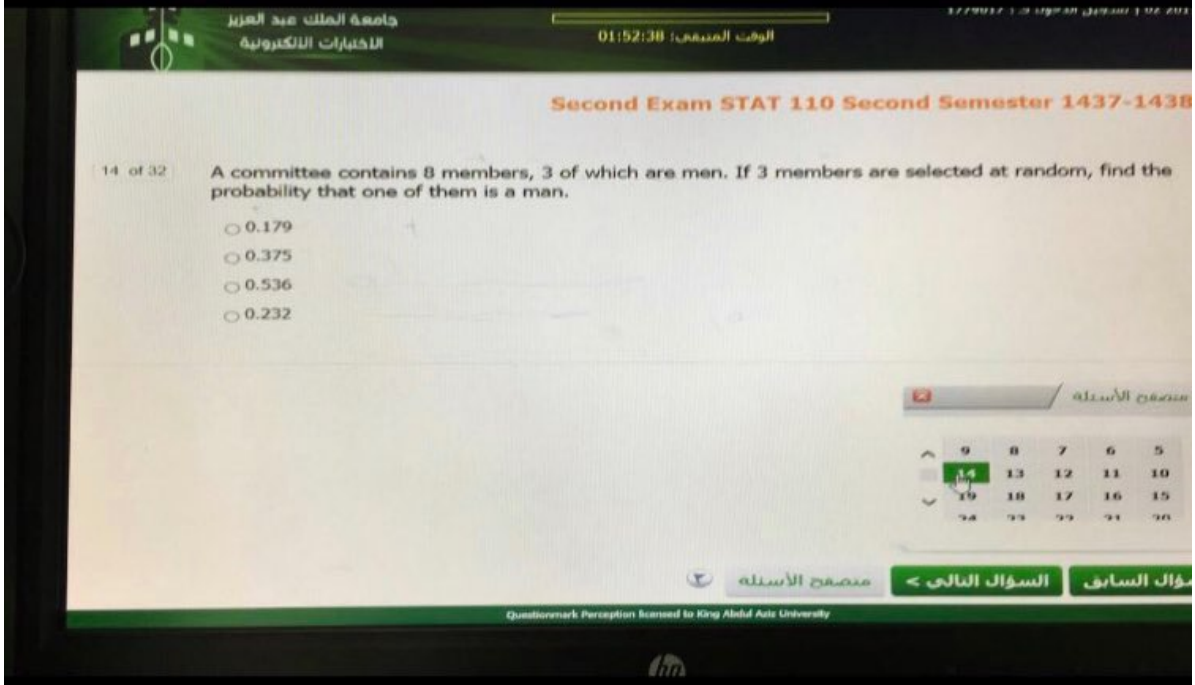


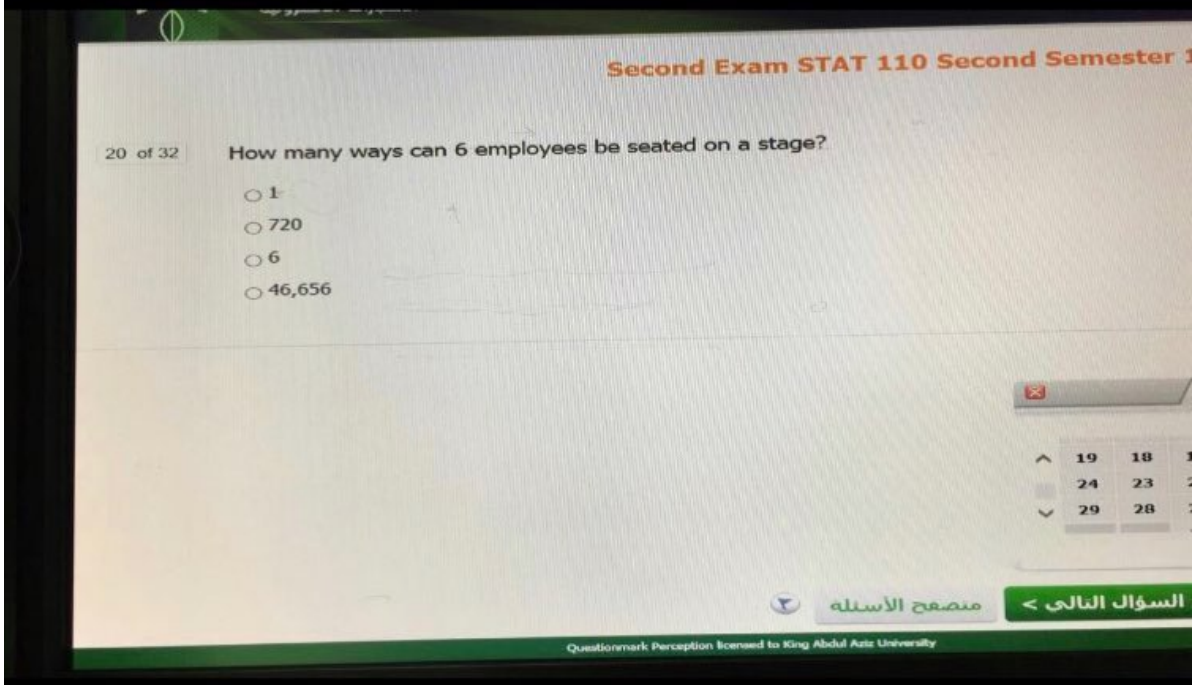


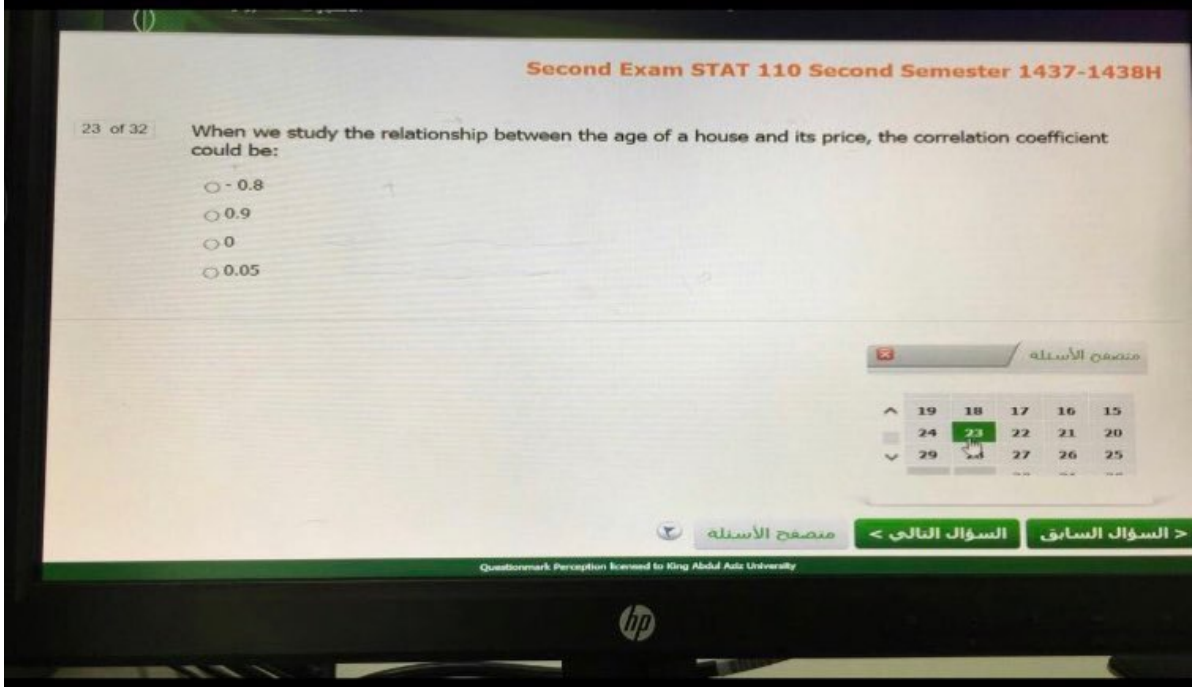


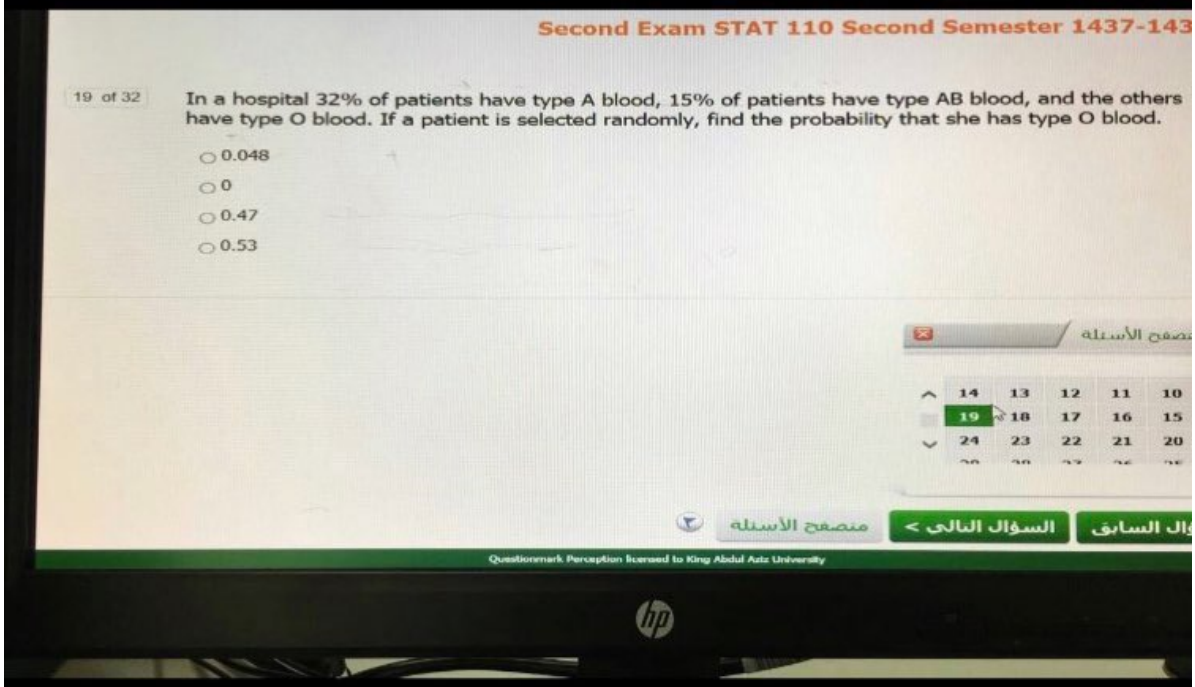


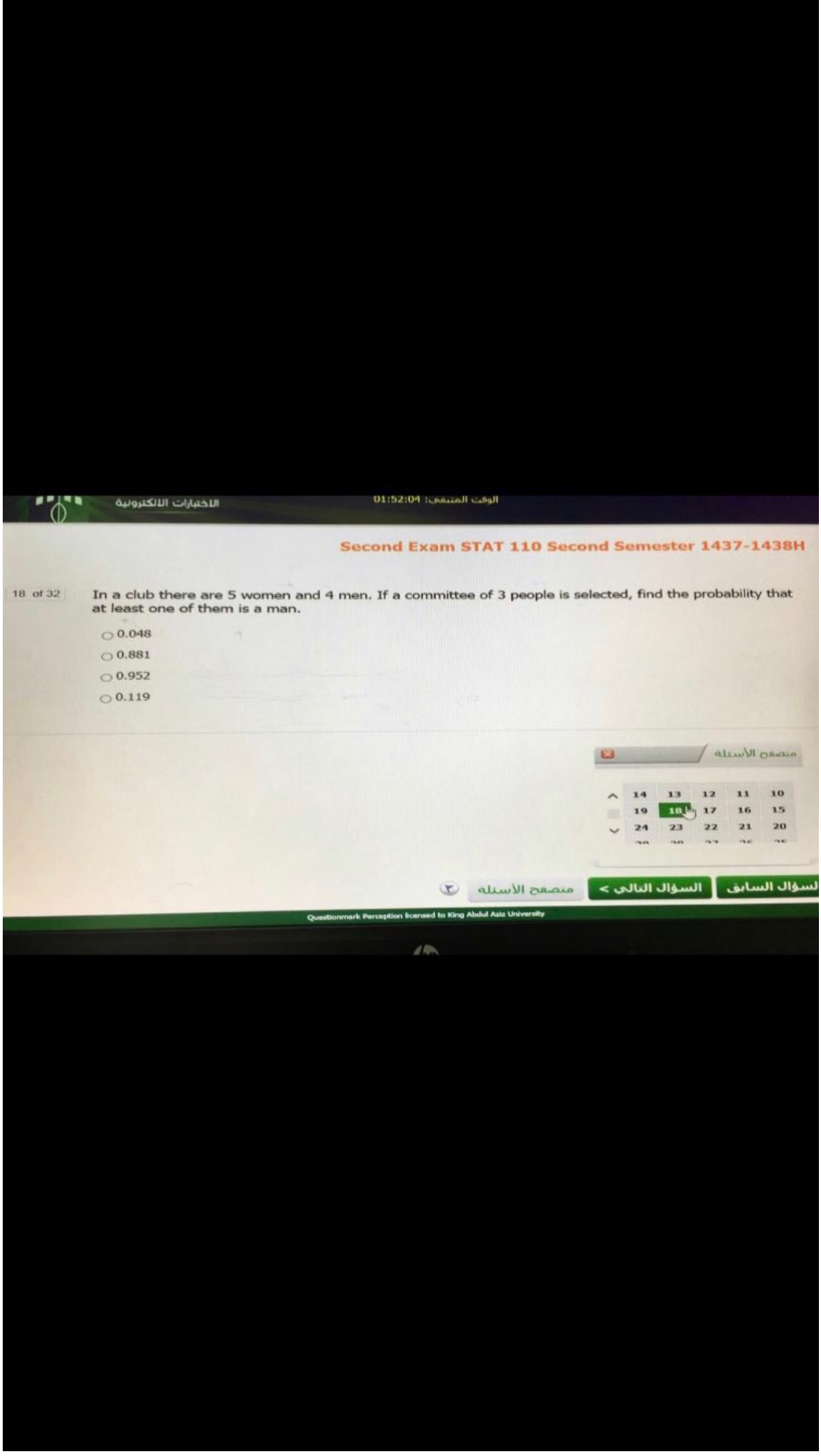


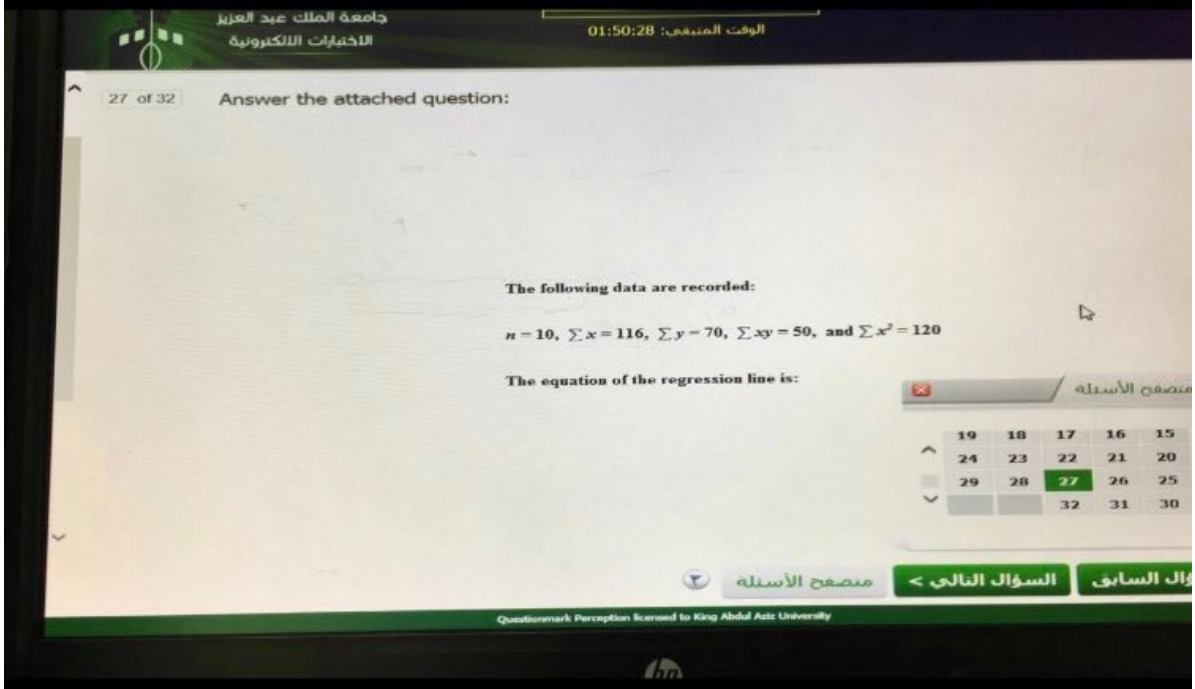


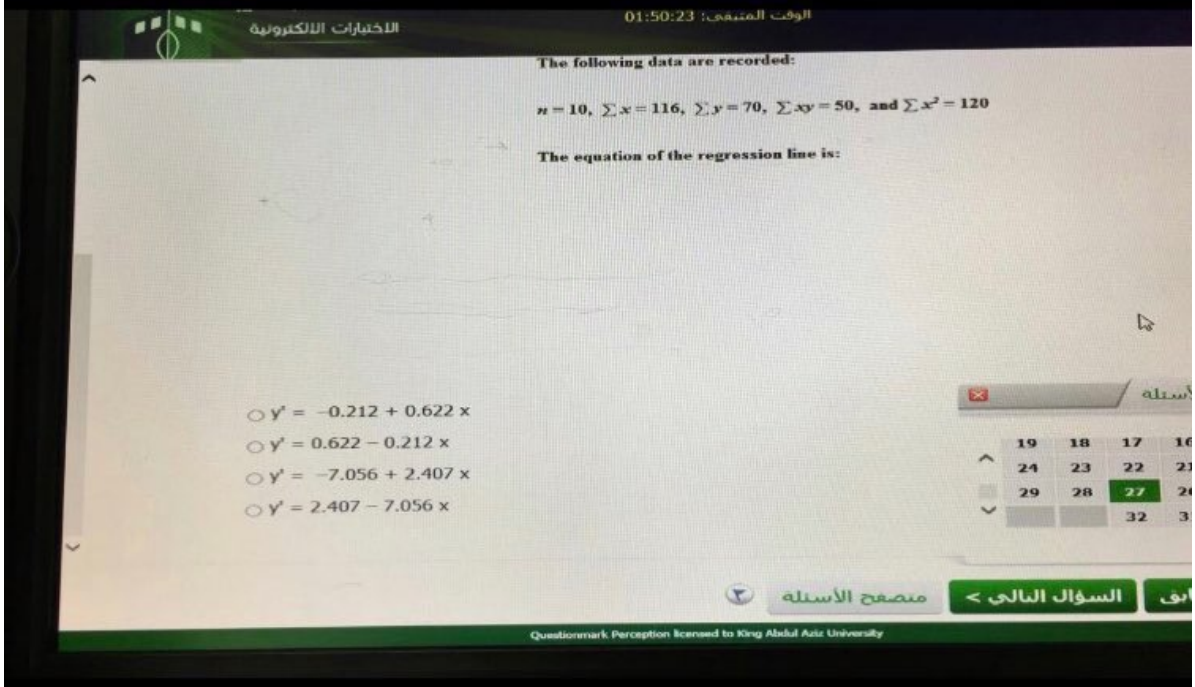


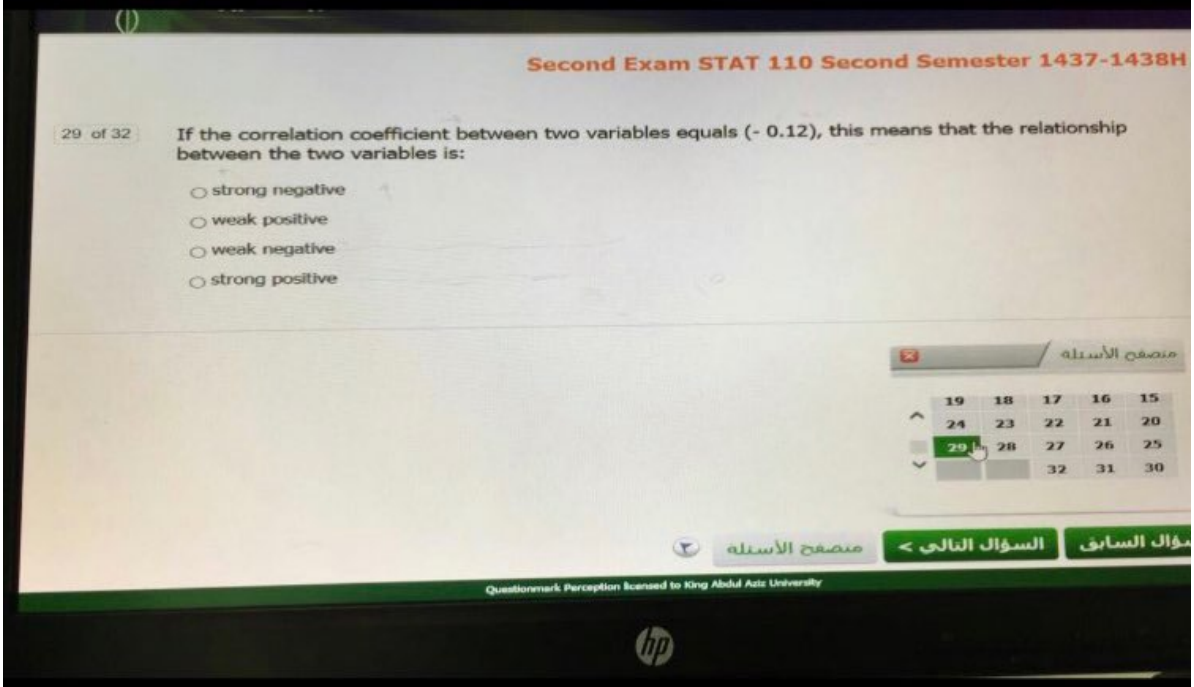












$n = 10$, $\sum x = 116$, $\sum y = 70$, $\sum xy = 50$, and $\sum x^2 = 120$

The equation of the regression line is:

- $y' = -0.212 + 0.622x$
- $y' = 0.622 - 0.212x$
- $y' = -7.056 + 2.407x$
- $y' = 2.407 - 7.056x$

King Abdul Aziz University Faculty of Sciences Mathematics Department
Math 110 Second Test Fall 2012 (30 Marks) Time 90 m
Student Name: Student Number: [A]

1) If $\frac{x^2-9}{x-3} \le f(x) \le x+3$, then $\lim_{x\to 0} f(x) =$

[A] does not exist [B] -3 [C] 0 [D] 3

2) The domain of the function $f(x) = \frac{1}{2-e^x}$ is

[A] $(2,\infty)$ [B] $\mathbb{R} = (-\infty,\infty)$

[C] $(-2,\infty)$ [D] $\mathbb{R}\setminus\{\ln 2\}$

3) $\lim_{x\to 0} \frac{\sin\left(\frac{3x}{2}\right)}{\tan\left(\frac{5x}{7}\right)} =$

[A] $\frac{15}{14}$ [B] $\frac{21}{10}$ [C] $\frac{10}{21}$ [D] $\frac{14}{15}$

4) The inverse of the function $f = \{(0,3),(-2,-1),(3,4),(5,-2),(1,7)\}$ is

[A] $f^{-1} = \{(0,3),(-1,-2),(4,3),(-2,5),(7,1)\}$

[B] $f^{-1} = \{(3,0),(-1,-2),(4,3),(-2,5),(7,1)\}$

[C] $f^{-1} = \{(0,3),(-2,-1),(4,3),(-2,5),(7,1)\}$

[D] $f^{-1} = \{(-2,-1),(3,4),(5,-2),(1,7),(0,3)\}$

5) Find the inverse of the function $f(x) = \frac{3x+1}{2x-5}$.

[A] $\frac{2x-5}{3x+1}$ [B] $\frac{5x+1}{2x-3}$ [C] $\frac{5x+1}{2x+3}$ [D] $\frac{5x-1}{2x-3}$

6) $\lim_{x\to 4} \frac{x^2-16}{x^2-4} =$

[A] 0 [B] 1 [C] $\frac{1}{8}$ [D] 8

7) $\lim_{x\to\infty} \frac{\sqrt{5x^2-8}+1}{x+7} =$

[A] 0 [B] $\sqrt{5}$ [C] $-\sqrt{5}$ [D] ∞

8) $\cos(2x) =$

[A] $1+2\sin^2 x$ [B] $1-2\sin^2 x$ [C] $-1-2\sin^2 x$ [D] $-1+2\sin^2 x$

9) If $2^{x^2+5x+9}=8$, then $x=$

[A] -3 or -2 [B] -6 or -1 [C] 6 or 1 [D] 2 or 3

10) $\lim_{x\to 4}\frac{x^2-3x-4}{x-4}=$

[A] -5 [B] 8 [C] 5 [D] does not exist

11) The number k that makes $f(x)=\begin{cases} k^2x^2+3x+1 & ;x\le 1 \\ 5kx-2 & ;x>1 \end{cases}$ continuous at 1 is

[A] -3 or -2 [B] -6 or -1 [C] 6 or 1 [D] 2 or 3

12) $\lim_{x\to -2}(x^3-2x+1)=$

[A] -3 [B] 3 [C] -11 [D] 13

13) $\cos^{-1}(\frac{\sqrt{3}}{2})=$

[A] $\frac{\pi}{2}$ rad [B] $\frac{\pi}{4}$ rad [C] $\frac{\pi}{3}$ rad [D] $\frac{\pi}{6}$ rad

14) $\lim_{x\to 0}\frac{x^3+3x^2}{x^2}=$

[A] 3 [B] -7 [C] -3 [D] 7

15) If $\sin(x)=\frac{1}{7}$, and $0<x<\frac{\pi}{2}$, then $\cos(x)=$

[A] $\frac{1}{4\sqrt{3}}$ [B] $4\sqrt{3}$ [C] $\frac{4\sqrt{3}}{7}$ [D] $\frac{7}{4\sqrt{3}}$

16) $\lim_{x\to 0}\frac{\sqrt{x+9}-3}{x}=$

[A] 0 [B] 1 [C] $\frac{1}{6}$ [D] 6

17) If $f(x)=\cos x$, then $D_f=$

[A] $(-\infty,1]$ [B] $(-\infty,-1)$ [C] $[-1,1]$ [D] $\mathbb{R}=(-\infty,\infty)$

18) If $f(x)=\begin{cases} 2x+3 & ;x\ge -2 \\ 2x+5 & ;x<-2 \end{cases}$, then $\lim_{x\to -2}f(x)=$

[A] 3 [B] does not exist [C] 1 [D] -1

19) $\frac{11\pi}{6}$ rad $=$

[A] 210^0 [B] 240^0 [C] 300^0 [D] 330^0

20) $300^0 =$

[A] $\frac{4\pi}{3}$ rad [B] $\frac{5\pi}{3}$ rad [C] $\frac{7\pi}{6}$ rad [D] $\frac{11\pi}{6}$ rad

21) The function $f(x) = \frac{x+1}{2-\ln x}$ is continuous on

[A] $\mathbb{R}$ [B] $\mathbb{R} \setminus \{\ln 2\}$ [C] $\mathbb{R} \setminus \{2\}$ [D] $\mathbb{R} \setminus \{e^2\}$

22) The vertical asymptote of $f(x) = \frac{3-x}{x^2-5x-6}$ is

[A] $y = -1,6$ [B] $x = -1,6$ [C] $x = -6,1$ [D] $y = -6,1$

23) $\lim_{x \to 9^+} \frac{|x-9|}{x-9} =$

[A] does not exist [B] 1 [C] 0 [D] -1

24) $\lim_{x \to 3} \frac{x^3-27}{x-3} =$

[A] does not exist [B] $\frac{1}{18}$ [C] $\frac{1}{27}$ [D] 27

25) $\lim_{x \to \frac{\pi}{3}} (\sin x - \cos x) =$

[A] $\frac{-\sqrt{3}-1}{2}$ [B] $\frac{\sqrt{3}-1}{2}$ [C] $\frac{\sqrt{3}+1}{2}$ [D] $\frac{1-\sqrt{3}}{2}$

26) Find the range of the function $f(x) = 3^x$.

[A] $(0,\infty)$ [B] $\mathbb{R} = (-\infty,\infty)$ [C] $(-\infty,0)$ [D] $[-1,1]$

27) $\lim_{x \to \infty} \frac{3x^2-5x+9}{6x^2+3x+2} =$

[A] $\frac{1}{6}$ [B] $\frac{1}{2}$ [C] ∞ [D] 0

28) Find the domain of the function $f(x) = \sin^{-1}(2x-5)$.

[A] $[2,3]$ [B] $(2,3)$ [C] $[-2,3]$ [D] $[-1,1]$

29) $\log_2 64 + \log_2 32 + 3\log_2 2 =$

[A] 4 [B] 14 [C] 8 [D] -2

30) $\sec\left(\frac{5\pi}{6}\right) =$

[A] $-\frac{2}{\sqrt{3}}$ [B] $-\frac{\sqrt{3}}{2}$ [C] $-\frac{1}{\sqrt{3}}$ [D] $-\sqrt{3}$

King Abdul Aziz University Faculty of Sciences Mathematics Department
Math 110 Second Test Fall 2012 (30 Marks) Time 90 m
Student Name: Student Number: [B]

1) $\frac{5\pi}{3}$ rad =

[A] 210^0 [B] 240^0 [C] 300^0 [D] 330^0

2) 210^0 =

[A] $\frac{4\pi}{3}$rad [B] $\frac{5\pi}{3}$rad [C] $\frac{7\pi}{6}$rad [D] $\frac{11\pi}{6}$rad

3) $\lim_{x\to 3}\frac{x-3}{x^3-27}=$

[A] 27 [B] $\frac{1}{18}$ [C] $\frac{1}{27}$ [D] does not exist

4) $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)=$

[A] $\frac{\pi}{3}$rad [B] $\frac{\pi}{6}$rad [C] $\frac{\pi}{2}$rad [D] $\frac{\pi}{4}$rad

5) If $\sin(x)=\frac{1}{7}$, and $0<x<\frac{\pi}{2}$, then $\cot(x)=$

[A] $\frac{1}{4\sqrt{3}}$ [B] $4\sqrt{3}$ [C] $\frac{4\sqrt{3}}{7}$ [D] $\frac{7}{4\sqrt{3}}$

6) $\log_2 64+\log_2 32-3\log_2 2=$

[A] 4 [B] 14 [C] 8 [D] -2

7) The vertical asymptote of $f(x)=\frac{3-x}{x^2+5x-6}$ is

[A] $y=-1,6$ [B] $x=-1,6$ [C] $x=-6,1$ [D] $y=-6,1$

8) $\lim_{x\to 0}\frac{\sqrt{x+25}-5}{x}=$

[A] $\frac{1}{10}$ [B] 1 [C] 0 [D] 10

9) If $f(x)=\begin{cases}2x+3 & ;x\geq -2\\ 2x+5 & ;x<-2\end{cases}$, then $\lim_{x\to -2^+} f(x)=$

[A] 3 [B] does not exist [C] 1 [D] -1

10) $\lim_{x\to -2}(x^3-2x+1)=$

[A] 3 [B] -3 [C] -11 [D] 13

11) $\lim_{x\to\infty}\dfrac{\sqrt{2x^2-8}+1}{x+7}=$

[A] $\sqrt{2}$ [B] 0 [C] $-\sqrt{2}$ [D] ∞

12) If $\dfrac{x^2+9}{x-3}\le f(x)\le x-3$, then $\lim_{x\to 0} f(x)=$

[A] does not exist [B] -3 [C] 0 [D] 3

13) $\tan\left(\dfrac{5\pi}{6}\right)=$

[A] $-\dfrac{2}{\sqrt{3}}$ [B] $-\dfrac{\sqrt{3}}{2}$ [C] $-\dfrac{1}{\sqrt{3}}$ [D] $-\sqrt{3}$

14) $\lim_{x\to 4}\dfrac{x^2-3x-4}{x-4}=$

[A] 5 [B] 8 [C] -5 [D] does not exist

15) $\lim_{x\to\frac{\pi}{3}}(\sin x+\cos x)=$

[A] $\dfrac{-\sqrt{3}-1}{2}$ [B] $\dfrac{\sqrt{3}-1}{2}$ [C] $\dfrac{\sqrt{3}+1}{2}$ [D] $\dfrac{1-\sqrt{3}}{2}$

16) The domain of the function $f(x)=\dfrac{1}{3-e^x}$ is

[A] $\mathbb{R}\setminus\{\ln 3\}$ [B] $\mathbb{R}=(-\infty,\infty)$ [C] $(-3,\infty)$ [D] $(3,\infty)$

17) The inverse of the function $f=\{(0,3),(-2,1),(3,4),(5,-2),(7,1)\}$ is

[A] $f^{-1}=\{(3,0),(1,-2),(4,3),(-2,5),(1,7)\}$

[B] $f^{-1}=\{(0,3),(1,-2),(4,3),(-2,5),(7,1)\}$

[C] $f^{-1}=\{(0,3),(-2,1),(4,3),(-2,5),(1,7)\}$

[D] $f^{-1}=\{(-2,1),(3,4),(5,-2),(1,7),(0,3)\}$

18) $\lim_{x\to\infty}\dfrac{5x^2-5x+9}{10x^2+3x+2}=$

[A] $\dfrac{1}{2}$ [B] $\dfrac{1}{10}$ [C] ∞ [D] 0

19) $\lim_{x\to 4}\dfrac{x-4}{x^2-16}=$

[A] 8 [B] 1 [C] $\dfrac{1}{8}$ [D] 0

20) $\cos(2x)=$

[A] $1+2\cos^2 x$ [B] $1-2\cos^2 x$ [C] $-1-2\cos^2 x$ [D] $-1+2\cos^2 x$

21) $\lim_{x\to 0}\dfrac{x^3-7x^2}{x^2}=$

[A] 3 [B] -7 [C] -3 [D] 7

22) Find the domain of the function $f(x)=\sin^{-1}(2x-11)$.

[A] $(5,6)$ [B] $[5,6]$ [C] $[-5,6]$ [D] $[-1,1]$

23) The function $f(x)=\dfrac{x+1}{3-\ln x}$ is continuous on

[A] $\mathbb{R}\setminus\{e^3\}$ [B] $\mathbb{R}\setminus\{\ln 3\}$ [C] $\mathbb{R}\setminus\{3\}$ [D] $\mathbb{R}$

24) If $2^{x^2-7x+9}=8$, then $x=$

[A] -3 or -2 [B] -6 or -1 [C] 6 or 1 [D] 2 or 3

25) $\lim_{x\to 7^-}\dfrac{|x-7|}{x-7}=$

[A] does not exist [B] 0 [C] 1 [D] -1

26) Find the inverse of the function $f(x)=\dfrac{3x+4}{7x-5}$.

[A] $\dfrac{7x-5}{3x+4}$ [B] $\dfrac{5x-4}{7x-3}$ [C] $\dfrac{5x+4}{7x-3}$ [D] $\dfrac{5x-4}{7x+3}$

27) $\lim_{x\to 0}\dfrac{\sin\left(\frac{5x}{7}\right)}{\tan\left(\frac{3x}{2}\right)}=$

[A] $\dfrac{15}{14}$ [B] $\dfrac{21}{10}$ [C] $\dfrac{10}{21}$ [D] $\dfrac{14}{15}$

28) If $f(x)=\sin x$, then $R_f=$

[A] $[-1,1]$ [B] $(0,1)$ [C] $\mathbb{R}=(-\infty,\infty)$ [D] $(-1,0]$

29) Find the domain of the function $f(x)=7^x$.

[A] $(0,\infty)$ [B] $\mathbb{R}=(-\infty,\infty)$ [C] $(-\infty,0)$ [D] $[-1,1]$

30) The number k that makes $f(x)=\begin{cases}k^2x^2+3x+1 & :x\le 1\\ -7kx-2 & ;x>1\end{cases}$ continuous at 1 is

[A] -3 or -2 [B] -6 or -1 [C] 6 or 1 [D] 2 or 3

King Abdul Aziz University Faculty of Sciences Mathematics Department
Math 110 Second Test Fall 2012 (30 Marks) Time 90 m
Student Name: Student Number: [C]

1) The function $f(x)=\dfrac{x+1}{5-\ln x}$ is continuous on

[A] $\mathbb{R}\setminus\{\ln 5\}$ [B] $\mathbb{R}\setminus\{e^5\}$ [C] $\mathbb{R}\setminus\{5\}$ [D] $\mathbb{R}$

2) If $f(x)=\sin x$, then D_f =

[A] $(-\infty,1]$ [B] $(-\infty,-1)$ [C] $\mathbb{R}=(-\infty,\infty)$ [D] $[-1,1]$

3) If $\sin(x)=\dfrac{1}{7}$, and $0<x<\dfrac{\pi}{2}$, then $\sec(x)=$

[A] $\dfrac{1}{4\sqrt{3}}$ [B] $4\sqrt{3}$ [C] $\dfrac{4\sqrt{3}}{7}$ [D] $\dfrac{7}{4\sqrt{3}}$

4) $\lim\limits_{x\to\infty}\dfrac{\sqrt{7x^2-8}+1}{x+1}=$

[A] $-\sqrt{7}$ [B] 0 [C] $\sqrt{7}$ [D] ∞

5) The domain of the function $f(x)=\dfrac{1}{7-e^x}$ is

[A] $\mathbb{R}=(-\infty,\infty)$ [B] $\mathbb{R}\setminus\{\ln 7\}$ [C] $(-7,\infty)$ [D] $(7,\infty)$

6) $\lim\limits_{x\to 4}\dfrac{x^2-3x-4}{x-4}=$

[A] 8 [B] 5 [C] -5 [D] does not exist

7) Find the range of the function $f(x)=2^x$.

[A] $(-\infty,0)$ [B] $[-1,1]$ [C] $(0,\infty)$ [D] $\mathbb{R}=(-\infty,\infty)$

8) If $f(x)=\begin{cases}2x+3 & ;x\geq -2\\ 2x+5 & ;x<-2\end{cases}$, then $\lim\limits_{x\to -2^-} f(x)=$

[A] 3 [B] does not exist
[C] 1 [D] -1

9) If $\dfrac{x^2-4}{x-2}\leq f(x)\leq x+2$, then $\lim\limits_{x\to 0} f(x)=$

[A] -2 [B] does not exist [C] 2 [D] 0

10) $\cot\left(\dfrac{5\pi}{6}\right)=$

[A] $-\dfrac{2}{\sqrt{3}}$ [B] $-\dfrac{\sqrt{3}}{2}$ [C] $-\dfrac{1}{\sqrt{3}}$ [D] $-\sqrt{3}$

11) $\lim_{x \to -2} (x^3 - 2x + 1) =$

[A] -11 [B] 3 [C] -3 [D] 13

12) Find the domain of the function $f(x) = \cos^{-1}(2x - 9)$.

[A] $(4,5)$ [B] $[-4,5]$ [C] $[4,5]$ [D] $[-1,1]$

13) $\log_2 64 - \log_2 32 - 3\log_2 2 =$

[A] 4 [B] 14 [C] 8 [D] -2

14) Find the inverse of the function $f(x) = \dfrac{2x - 7}{3x - 9}$.

[A] $\dfrac{3x - 9}{2x - 7}$ [B] $\dfrac{9x - 7}{3x - 2}$ [C] $\dfrac{9x + 7}{3x + 2}$ [D] $\dfrac{9x - 7}{3x + 2}$

15) The vertical asymptote of $f(x) = \dfrac{3 - x}{x^2 + x - 6}$ is

[A] $y = -3,2$ [B] $x = -3,2$ [C] $x = -2,3$ [D] $y = -2,3$

16) $\lim_{x \to 0} \dfrac{x^3 - 3x^2}{x^2} =$

[A] 3 [B] -7 [C] -3 [D] 7

17) The number k that makes $f(x) = \begin{cases} k^2x^2 + 3x + 1 & : x \le 1 \\ -5kx - 2 & ; x > 1 \end{cases}$ continuous at 1 is

[A] -3 or -2 [B] -6 or -1 [C] 6 or 1 [D] 2 or 3

18) $\lim_{x \to 7} \dfrac{x - 7}{x^2 - 49} =$

[A] 14 [B] $\dfrac{1}{14}$ [C] 1 [D] 0

19) $\lim_{x \to 2} \dfrac{x - 2}{x^3 - 8} =$

[A] 12 [B] $\dfrac{1}{12}$ [C] $\dfrac{1}{8}$ [D] does not exist

20) The inverse of the function $f = \{(0,3),(-2,1),(3,4),(5,1),(7,1)\}$ is

[A] $f^{-1} = \{(-2,1),(3,4),(5,1),(1,7),(0,3)\}$

[B] $f^{-1} = \{(0,3),(1,-2),(4,3),(1,5),(7,1)\}$

[C] $f^{-1} = \{(0,3),(-2,1),(4,3),(1,5),(1,7)\}$

[D] $f^{-1} = \{(3,0),(1,-2),(4,3),(1,5),(1,7)\}$

21) $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)=$

[A] $\frac{\pi}{3}$ rad [B] $\frac{\pi}{6}$ rad [C] $\frac{\pi}{2}$ rad [D] $\frac{\pi}{4}$ rad

22) $\lim_{x\to\infty}\frac{2x^2-5x+1}{8x^2+3x-2}=$

[A] 0 [B] $\frac{1}{8}$ [C] ∞ [D] $\frac{1}{4}$

23) If $2^{x^2-5x+9}=8$, then $x=$

[A] -3 or -2 [B] -6 or -1 [C] 6 or 1 [D] 2 or 3

24) $\lim_{x\to 2^+}\frac{|x-2|}{x-2}=$

[A] does not exist [B] 0 [C] 1 [D] -1

25) $\lim_{x\to 0}\frac{x}{\sqrt{x+49}-7}=$

[A] $\frac{1}{14}$ [B] 14 [C] 0 [D] 1

26) $\lim_{x\to\frac{\pi}{3}}(\cos x-\sin x)=$

[A] $\frac{-\sqrt{3}-1}{2}$ [B] $\frac{\sqrt{3}-1}{2}$ [C] $\frac{\sqrt{3}+1}{2}$ [D] $\frac{1-\sqrt{3}}{2}$

27) $-\cos(2x)=$

[A] $-1-2\sin^2 x$ [B] $1-2\sin^2 x$ [C] $-1+2\sin^2 x$ [D] $1+2\sin^2 x$

28) $\lim_{x\to 0}\frac{\sin\left(\frac{2x}{3}\right)}{\tan\left(\frac{5x}{7}\right)}=$

[A] $\frac{15}{14}$ [B] $\frac{21}{10}$ [C] $\frac{10}{21}$ [D] $\frac{14}{15}$

29) $330^0=$

[A] $\frac{4\pi}{3}$ rad [B] $\frac{5\pi}{3}$ rad [C] $\frac{7\pi}{6}$ rad [D] $\frac{11\pi}{6}$ rad

30) $\frac{7\pi}{6}$ rad $=$

[A] 210^0 [B] 240^0 [C] 300^0 [D] 330^0

King Abdul Aziz University Faculty of Sciences Mathematics Department
Math 110 Second Test Fall 2012 (30 Marks) Time 90 m
Student Name: Student Number: [D]

1) The vertical asymptote of $f(x)=\dfrac{7-x}{x^2-x-6}$ is

[A] $y=-3,2$ [B] $x=-3,2$
[C] $x=-2,3$ [D] $y=-2,3$

2) $\lim\limits_{x\to 0}\dfrac{\sin\left(\frac{5x}{7}\right)}{\tan\left(\frac{2x}{3}\right)}=$

[A] $\dfrac{15}{14}$ [B] $\dfrac{21}{10}$ [C] $\dfrac{10}{21}$ [D] $\dfrac{14}{15}$

3) If $f(x)=\begin{cases}2x+7 & ;x\geq -2\\ 3x+9 & ;x<-2\end{cases}$, then $\lim\limits_{x\to -2} f(x)=$

[A] 3 [B] does not exist [C] 1 [D] -1

4) The inverse of the function $f=\{(2,3),(-2,1),(3,4),(5,1),(7,1)\}$ is .

[A] $f^{-1}=\{(-2,1),(3,4),(5,1),(1,7),(2,3)\}$
[B] $f^{-1}=\{(2,3),(1,-2),(4,3),(1,5),(7,1)\}$
[C] $f^{-1}=\{(3,2),(1,-2),(4,3),(1,5),(1,7)\}$
[D] $f^{-1}=\{(2,3),(-2,1),(4,3),(1,5),(1,7)\}$

5) $\log_2 64-\log_2 32+3\log_2 2=$

[A] 4 [B] 14 [C] 8 [D] -2

6) $300^0=$

[A] $\dfrac{4\pi}{3}$rad [B] $\dfrac{5\pi}{3}$rad [C] $\dfrac{7\pi}{6}$rad [D] $\dfrac{11\pi}{6}$rad

7) $\dfrac{4\pi}{3}$ rad $=$

[A] 210^0 [B] 240^0 [C] 300^0 [D] 330^0

8) The function $f(x)=\dfrac{x+1}{7-\ln x}$ is continuous on

[A] $\mathbb{R}\setminus\{\ln 7\}$ [B] $\mathbb{R}\setminus\{7\}$ [C] $\mathbb{R}\setminus\{e^7\}$ [D] $\mathbb{R}$

9) $\lim\limits_{x\to\infty}\dfrac{\sqrt{13x^2-8}+6}{x+1}=$

[A] $-\sqrt{13}$ [B] 0 [C] ∞ [D] $\sqrt{13}$

10) $-\cos(2x) =$

[A] $1-2\cos^2 x$ [B] $-1-2\cos^2 x$ [C] $-1+2\cos^2 x$ [D] $1+2\cos^2 x$

11) $\lim_{x\to -2}(x^3-2x+1) =$

[A] -11 [B] 3 [C] 13 [D] -3

12) $\lim_{x\to\infty}\frac{3x^2-8x+15}{9x^2+4x-13} =$

[A] 0 [B] $\frac{1}{9}$ [C] $\frac{1}{3}$ [D] ∞

13) $\lim_{x\to 0}\frac{x^3+7x^2}{x^2} =$

[A] 3 [B] -7 [C] -3 [D] 7

14) The number k that makes $f(x)=\begin{cases} k^2x^2+3x+1 & ;x\le 1 \\ 7kx-2 & ;x>1 \end{cases}$ continuous at 1 is

[A] -3 or -2 [B] -6 or -1 [C] 6 or 1 [D] 2 or 3

15) $\lim_{x\to 4}\frac{x^2-3x-4}{x-4} =$

[A] 8 [B] does not exist [C] -5 [D] 5

16) Find the inverse of the function $f(x)=\frac{7x+2}{3x-9}$.

[A] $\frac{9x+2}{3x-7}$ [B] $\frac{9x-2}{3x+7}$ [C] $\frac{9x-2}{3x-7}$ [D] $\frac{3x-9}{7x+2}$

17) $\lim_{x\to 0}\frac{x}{\sqrt{x+16}-4} =$

[A] $\frac{1}{8}$ [B] 0 [C] 8 [D] 1

18) If $2^{x^2+7x+9}=8$, then $x =$

[A] -3 or -2 [B] -6 or -1 [C] 6 or 1 [D] 2 or 3

19) If $f(x)=\cos x$, then $R_f =$

[A] $(0,1)$ [B] $[-1,1]$ [C] $\mathbb{R}=(-\infty,\infty)$ [D] $(-1,0]$

20) $\lim_{x\to 7}\frac{x^2-49}{x-7} =$

[A] 14 [B] $\frac{1}{14}$ [C] 1 [D] 0

21) Find the domain of the function $f(x)=5^{x}$.

[A] $(-\infty,0)$ [B] $[-1,1]$ [C] $(0,\infty)$ [D] $\mathbb{R}=(-\infty,\infty)$

22) $\sin^{-1}\left(\frac{1}{\sqrt{2}}\right)=$

[A] $\frac{\pi}{3}$ rad [B] $\frac{\pi}{6}$ rad [C] $\frac{\pi}{2}$ rad [D] $\frac{\pi}{4}$ rad

23) $\lim_{x\to\frac{\pi}{3}}(-\cos x-\sin x)=$

[A] $\frac{-\sqrt{3}-1}{2}$ [B] $\frac{\sqrt{3}-1}{2}$ [C] $\frac{\sqrt{3}+1}{2}$ [D] $\frac{1-\sqrt{3}}{2}$

24) Find the domain of the function $f(x)=\sin^{-1}(2x-7)$.

[A] $(3,4)$ [B] $[-3,4]$ [C] $[-1,1]$ [D] $[3,4]$

25) $\lim_{x\to2}\frac{x^{3}-8}{x-2}=$

[A] 12 [B] $\frac{1}{12}$ [C] 8 [D] does not exist

26) If $\sin(x)=\frac{1}{7}$, and $0<x<\frac{\pi}{2}$, then $\tan(x)=$

[A] $\frac{1}{4\sqrt{3}}$ [B] $4\sqrt{3}$ [C] $\frac{4\sqrt{3}}{7}$ [D] $\frac{7}{4\sqrt{3}}$

27) If $\frac{x^{2}+4}{x-2}\le f(x)\le x-2$, then $\lim_{x\to0}f(x)=$

[A] −2 [B] does not exist [C] 2 [D] 0

28) $\cos\left(\frac{5\pi}{6}\right)=$

[A] $-\frac{2}{\sqrt{3}}$ [B] $-\frac{\sqrt{3}}{2}$ [C] $-\frac{1}{\sqrt{3}}$ [D] $-\sqrt{3}$

29) $\lim_{x\to5}\frac{|x-5|}{x-5}=$

[A] does not exist [B] 0 [C] 1 [D] −1

30) The domain of the function $f(x)=\frac{1}{5-e^{x}}$ is

[A] $\mathbb{R}=(-\infty,\infty)$ [B] $(-5,\infty)$ [C] $\mathbb{R}\setminus\{\ln 5\}$ [D] $(5,\infty)$