Workshop Solutions to Section 2.6

1) The inverse of the function $f = \{(0,3), (-2,1), (3,4), (5,-2), (1,7)\}$ is $f^{-1} = \{(3,0), (1,-2), (4,3), (-2,5), (7,1)\}$	2) Find the inverse of the function $f(x) = 2x + 3$. Solution: Let $y = 2x + 3$ $2x = y - 3$ $x = \frac{y-3}{2}$ Now, change x with y $(x \Leftrightarrow y)$ $y = \frac{x-3}{2}$ $\therefore f^{-1}(x) = \frac{x-3}{2}$
3) Find the inverse of the function $f(x) = 3 - 2x$. Solution: Let $y = 3 - 2x$ $2x = 3 - y$ $x = \frac{3-y}{2}$ Now, change x with y $(x \Leftrightarrow y)$ $y = \frac{3-x}{2}$ $\therefore f^{-1}(x) = \frac{3-x}{2}$	4) Find the inverse of the function $f(x) = 3 - \frac{x}{2}$. Solution: Let $y = 3 - \frac{x}{2}$ $2y = 6 - x$ $x = 6 - 2y$ Now, change x with y $(x \Leftrightarrow y)$ $y = 6 - 2x$ $\therefore f^{-1}(x) = 6 - 2x$
5) Find the inverse of the function $f(x) = \sqrt{2x-3}$. Solution: Let $y = \sqrt{2x-3}$ by squaring both sides $y^2 = 2x - 3$ $2x = y^2 + 3$ $x = \frac{y^2+3}{2}$ Now, change x with y $(x \Leftrightarrow y)$ $y = \frac{x^2+3}{2}$ $\therefore f^{-1}(x) = \frac{x^2+3}{2}$	6) Find the inverse of the function $f(x) = \sqrt[3]{3-2x}$. Solution: Let $y = \sqrt[3]{3-2x}$ by cubing both sides $y^3 = 3 - 2x$ $2x = 3 - y^3$ $x = \frac{3-y^3}{2}$ Now, change x with y $(x \Leftrightarrow y)$ $y = \frac{3-x^3}{2}$ $\therefore f^{-1}(x) = \frac{3-x^3}{2}$
7) Find the inverse of the function $f(x) = (2x+3)^2, x \in [0,\infty)$. Solution: Let $y = (2x+3)^2$ Take the square root for both sides $\sqrt{y} = 2x + 3$ $2x = \sqrt{y} - 3$ $x = \frac{\sqrt{y}-3}{2}$ Now, change x with y $(x \Leftrightarrow y)$ $y = \frac{\sqrt{x}-3}{2}$ $\therefore f^{-1}(x) = \frac{\sqrt{x}-3}{2}$	8) Find the inverse of the function $f(x) = -(x-3)^3$. Solution: Let $y = -(x-3)^3$ $-y = (x-3)^3$ Take the cubic root for both sides $\sqrt[3]{-y} = x - 3$ $x = \sqrt[3]{-y} + 3$ Now, change x with y $(x \Leftrightarrow y)$ $y = \sqrt[3]{-x} + 3$ $\therefore f^{-1}(x) = \sqrt[3]{-x} + 3$
9) Find the inverse of the function $f(x) = \frac{x}{x-3}$. Solution: Let $y = \frac{x}{x-3}$ $y(x-3) = x$ $xy - 3y = x$ $xy - x = 3y$ $x(y-1) = 3y$ $x = \frac{3y}{y-1}$ Now, change x with y $(x \Leftrightarrow y)$ $y = \frac{3x}{x-1}$ $\therefore f^{-1}(x) = \frac{3x}{x-1}$	10) Find the inverse of the function $f(x) = \frac{x-3}{x}$. Solution: Let $y = \frac{x-3}{x}$ $xy = x - 3$ $xy - x = -3$ $x(y-1) = -3$ $x = \frac{-3}{y-1} = -\frac{3}{y-1} = \frac{3}{-(y-1)} = \frac{3}{1-y}$ Now, change x with y $(x \Leftrightarrow y)$ $y = \frac{3}{1-x}$ $\therefore f^{-1}(x) = \frac{3}{1-x}$

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

Solution:

Let $y = \frac{x+2}{x-3}$

$$y(x-3) = x+2$$
$$xy - 3y = x+2$$
$$xy - x = 3y+2$$
$$x(y-1) = 3y+2$$
$$x = \frac{3y+2}{y-1}$$

Now, change x with y $(x \Leftrightarrow y)$

$$y = \frac{3x+2}{x-1}$$

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

12) Find the inverse of the function $f(x) = \sqrt{x} + 5$.

Solution:

Let $y = \sqrt{x} + 5$

$\sqrt{x} = y - 5$ by squaring both sides

$$x = (y-5)^2$$

Now, change x with y $(x \Leftrightarrow y)$

$$y = (x-5)^2$$

$$\therefore\ f^{-1}(x) = (x-5)^2$$

13) Find the inverse of the function $f(x) = \sqrt[3]{x^5}$.

Solution:

Let $y = \sqrt[3]{x^5}$

$$y = x^{\frac{5}{3}}$$

$$y^{\frac{3}{5}} = (x^{\frac{5}{3}})^{\frac{3}{5}}$$

$$x = \sqrt[5]{y^3}$$

Now, change x with y $(x \Leftrightarrow y)$

$$y = \sqrt[5]{x^3}$$

$$\therefore\ f^{-1}(x) = \sqrt[5]{x^3}$$

14) Find the inverse of the function $f(x) = 2x^3 - 5$.

Solution:

Let $y = 2x^3 - 5$

$$2x^3 = y+5$$

$x^3 = \frac{y+5}{2}$ take the cubic root for both sides

$$x = \sqrt[3]{\frac{y+5}{2}}$$

Now, change x with y $(x \Leftrightarrow y)$

$$y = \sqrt[3]{\frac{x+5}{2}}$$

$$\therefore\ f^{-1}(x) = \sqrt[3]{\frac{x+5}{2}}$$

15) Find the inverse of the function $f(x) = \sqrt[3]{\frac{x+2}{5}}$.

Solution:

Let $y = \sqrt[3]{\frac{x+2}{5}}$ by cubing both sides

$$y^3 = \frac{x+2}{5}$$
$$5y^3 = x+2$$
$$x = 5y^3 - 2$$

Now, change x with y $(x \Leftrightarrow y)$

$$y = 5x^3 - 2$$

$$\therefore\ f^{-1}(x) = 5x^3 - 2$$

16) Evaluate

$$2^{log_2(5x+3)}.$$

Solution:

$$2^{log_2(5x+3)} = 5x+3$$

17) Evaluate

$$log_2 2^{(5x+3)}.$$

Solution:

$$log_2 2^{(5x+3)} = 5x+3$$

18) $log_2 64 - log_2 32 + log_2 2 = log_2 \frac{64\times2}{32}$

$$= log_2 4 = log_2 2^2$$
$$= 2log_2 2$$
$$= 2\times1 = 2$$

OR

$$log_2 64 - log_2 32 + log_2 2 = log_2 2^6 - log_2 2^5 + log_2 2$$
$$= 6 - 5 + 1 = 2$$

19) $log_3 27 - log_3 81 + 5\,log_3 3 = log_3 \frac{27\times3^5}{81}$

$$= log_3 81 = log_3 3^4$$
$$= 4log_3 3$$
$$= 4\times1 = 4$$

OR

$$log_3 27 - log_3 81 + 5\,log_3 = log_3 3^3 - log_3 3^4 + 5\times1$$
$$= 3 - 4 + 5 = 4$$

20) $log_3 54 - log_3 2 = log_3 \frac{54}{2}$

$$= log_3 27 = log_3 3^3 = 3$$

21) If $log_2(6+2x) = 1$, then $x =$

Solution:

$$log_2(6+2x) = 1$$
$$2^{log_2(6+2x)} = 2^1$$
$$6+2x = 2$$
$$2x = 2-6 = -4$$
$$x = -2$$

22) If $ln(x+3) = 5$, then $x =$

Solution:

$$ln(x+3) = 5$$
$$e^{ln(x+3)} = e^5$$
$$x+3 = e^5$$
$$x = e^5 - 3$$

23) If $ln(x) = 5$, then $x =$

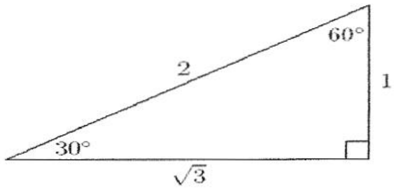
Solution:

$$ln(x) = 5$$
$$e^{ln(x)} = e^5$$
$$x = e^5$$

24) If $e^{(2x-3)} = 5$, then $x =$ Solution: $e^{(2x-3)} = 5$ $lne^{(2x-3)} = ln5$ $2x - 3 = ln5$ $2x = ln5 + 3$ $x = \frac{ln5+3}{2}$	25) $log_3 2 = \frac{ln2}{ln3}$ 26) $\log\ 25 + \log\ 4 = \log(25 \times 4)$ $= \log 100 = \log 10^2$ $= 2$
27) $log_3 18 - log_3 6 = log_3 \frac{18}{6}$ $= log_3 3$ $= 1$	28) $log_2 6 - log_2 15 + log_2 20 = log_2 \frac{6\times 20}{15}$ $= log_2 8 = log_2 2^3$ $= 3$
29) $e^{3ln2} = e^{ln2^3} = 2^3 = 8$ 30) If $3^{2-x} = 6$, then $x =$ Solution: $3^{2-x} = 6$ $log_3 3^{2-x} = log_3 6$ $2 - x = log_3 6$ $x = 2 - log_3 6 = 2 - log_3(3 \times 2)$ $= 2 - (log_3 3 + log_3 2) = 2 - (1 + log_3 2)$ $= 2 - 1 - log_3 2$ $= 1 - log_3 2$	31) Find the inverse of the function $f(x) = 5 + lnx$. Solution: Let $y = 5 + lnx$ $lnx = y - 5$ $e^{lnx} = e^{y-5}$ $x = e^{y-5}$ Now, change x with y $(x \Leftrightarrow y)$ $y = e^{x-5}$ $\therefore\ f^{-1}(x) = e^{x-5}$
32) Find the domain of the function $f(x) = \sin^{-1}(3x+5)$. Solution: We know that the domain of $\sin^{-1}(x)$ is $[-1,1]$. So, $-1 \le 3x + 5 \le 1$ $-6 \le 3x \le -4$ $-2 \le x \le -\frac{4}{3}$ $\therefore\ D_f = \left[-2, -\frac{4}{3}\right]$	33) Find the domain of the function $f(x) = \cos^{-1}(3x-5)$. Solution: We know that the domain of $\cos^{-1}(x)$ is $[-1,1]$. So, $-1 \le 3x - 5 \le 1$ $4 \le 3x \le 6$ $\frac{4}{3} \le x \le 2$ $\therefore\ D_f = \left[\frac{4}{3}, 2\right]$
34) Find the domain of the function $f(x) = 2\sin^{-1}(x) + 1$. Solution: We know that the domain of $\sin^{-1}(x)$ is $[-1,1]$. So, $\therefore\ D_f = [-1,1]$	

Before proceeding to the questions 35-55, we should be aware of the following well-known right triangles:

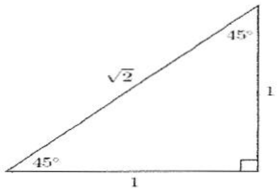
$30^o - 60^o$ Right Triangle



We know that $30^o = \frac{\pi}{6}$ and $60^o = \frac{\pi}{3}$, so

$$\sin\left(\frac{\pi}{6}\right) = \frac{1}{2} \qquad \sin\left(\frac{\pi}{3}\right) = \frac{\sqrt{3}}{2}$$
$$\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2} \qquad \cos\left(\frac{\pi}{3}\right) = \frac{1}{2}$$
$$\tan\left(\frac{\pi}{6}\right) = \frac{1}{\sqrt{3}} \qquad \tan\left(\frac{\pi}{3}\right) = \sqrt{3}$$
$$\cot\left(\frac{\pi}{6}\right) = \sqrt{3} \qquad \cot\left(\frac{\pi}{3}\right) = \frac{1}{\sqrt{3}}$$
$$\sec\left(\frac{\pi}{6}\right) = \frac{2}{\sqrt{3}} \qquad \sec\left(\frac{\pi}{3}\right) = 2$$
$$\csc\left(\frac{\pi}{6}\right) = 2 \qquad \csc\left(\frac{\pi}{3}\right) = \frac{2}{\sqrt{3}}$$

$30^o - 60^o$ Right Triangle



We know that $45^o = \frac{\pi}{4}$, so

$$\sin\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}}$$
$$\cos\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}}$$
$$\tan\left(\frac{\pi}{4}\right) = 1$$
$$\cot\left(\frac{\pi}{4}\right) = 1$$
$$\sec\left(\frac{\pi}{4}\right) = \sqrt{2}$$
$$\csc\left(\frac{\pi}{4}\right) = \sqrt{2}$$

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

Solution:

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

$\sin\theta = \frac{\sqrt{3}}{2}$

Use the $30^o - 60^o$ right triangle to find θ. Thus,

$$\theta = \frac{\pi}{3}$$

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

Solution:

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

$\sin\theta = \frac{\sqrt{3}}{2}$

Use the $30^o - 60^o$ right triangle to find θ. Thus,

$$\theta = \frac{\pi}{3}$$

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

Solution:

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

$\tan\theta = \frac{1}{\sqrt{3}}$

Use the $30^o - 60^o$ right triangle to find θ. Thus,

$$\theta = \frac{\pi}{6}$$

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

Solution:

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

$\sin\theta = \frac{1}{\sqrt{2}}$

Use the $45^o - 45^o$ right triangle to find θ. Thus,

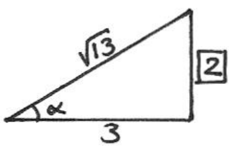
$$\theta = \frac{\pi}{4}$$

39) If $\alpha = \cos^{-1}\left(\frac{3}{\sqrt{13}}\right)$, then $\tan\alpha =$

Solution:

$\alpha = \cos^{-1}\left(\frac{3}{\sqrt{13}}\right)$

$\cos\alpha = \frac{3}{\sqrt{13}} = \frac{adj}{hyp}$



Now, we should find the length of the opposite side using the Pythagorean Theorem, so

$$|\text{opposite}| = \sqrt{\left(\sqrt{13}\right)^2 - 3^2} = \sqrt{13-9} = \sqrt{4} = 2$$

$$\therefore \tan\alpha = \frac{opp}{adj} = \frac{2}{3}$$

40) If $\alpha = \cos^{-1}\left(\frac{3}{\sqrt{13}}\right)$, then $\csc\alpha =$

Solution:

$\alpha = \cos^{-1}\left(\frac{3}{\sqrt{13}}\right)$

$\cos\alpha = \frac{3}{\sqrt{13}} = \frac{adj}{hyp}$

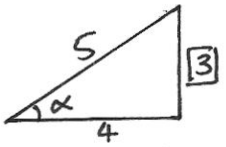
Now, we should find the length of the opposite side using the Pythagorean Theorem, so

$$|\text{opposite}| = \sqrt{\left(\sqrt{13}\right)^2 - 3^2} = \sqrt{13-9} = \sqrt{4} = 2$$

$$\therefore \csc\alpha = \frac{1}{\sin\alpha} = \frac{hyp}{opp} = \frac{\sqrt{13}}{2}$$

41) If $\alpha = \cos^{-1}\left(\frac{4}{5}\right)$, then $\csc\alpha =$

Solution:



$\alpha = \cos^{-1}\left(\frac{4}{5}\right)$

$\cos\alpha = \frac{4}{5} = \frac{adj}{hyp}$

Now, we should find the length of the opposite side using the Pythagorean Theorem, so

$|\text{opposite}| = \sqrt{5^2 - 4^2} = \sqrt{25-16} = \sqrt{9} = 3$

$$\therefore \csc\alpha = \frac{1}{\sin\alpha} = \frac{hyp}{opp} = \frac{5}{3}$$

42) If $\alpha = \cos^{-1}\left(\frac{4}{5}\right)$, then $\cot\alpha =$

Solution:

$\alpha = \cos^{-1}\left(\frac{4}{5}\right)$

$\cos\alpha = \frac{4}{5} = \frac{adj}{hyp}$

Now, we should find the length of the opposite side using the Pythagorean Theorem, so

$|\text{opposite}| = \sqrt{5^2 - 4^2} = \sqrt{25-16} = \sqrt{9} = 3$

$$\therefore \cot\alpha = \frac{1}{\tan\alpha} = \frac{adj}{opp} = \frac{4}{3}$$

43) If $\alpha = \cos^{-1}\left(\frac{4}{5}\right)$, then $\tan\alpha =$

Solution:

$\alpha = \cos^{-1}\left(\frac{4}{5}\right)$

$\cos\alpha = \frac{4}{5} = \frac{adj}{hyp}$

Now, we should find the length of the opposite side using the Pythagorean Theorem, so

$|\text{opposite}| = \sqrt{5^2 - 4^2} = \sqrt{25-16} = \sqrt{9} = 3$

$$\therefore \tan\alpha = \frac{1}{\cot\alpha} = \frac{opp}{adj} = \frac{3}{4}$$

44) If $\alpha = \cos^{-1}\left(\frac{4}{5}\right)$, then $\sin\alpha =$

Solution:

$\alpha = \cos^{-1}\left(\frac{4}{5}\right)$

$\cos\alpha = \frac{4}{5} = \frac{adj}{hyp}$

Now, we should find the length of the opposite side using the Pythagorean Theorem, so

$|\text{opposite}| = \sqrt{5^2 - 4^2} = \sqrt{25-16} = \sqrt{9} = 3$

$$\therefore \sin\alpha = \frac{opp}{hyp} = \frac{3}{5}$$

45) $\sin\left(\cos^{-1}\left(\frac{4}{5}\right)\right) =$

Solution:

Let $\alpha = \cos^{-1}\left(\frac{4}{5}\right)$

$\cos\alpha = \frac{4}{5} = \frac{adj}{hyp}$

Now, we should find the length of the opposite side using the Pythagorean Theorem, so

$|\text{opposite}| = \sqrt{5^2 - 4^2} = \sqrt{25-16} = \sqrt{9} = 3$

$$\therefore \sin\left(\cos^{-1}\left(\frac{4}{5}\right)\right) = \sin(\alpha) = \frac{opp}{hyp} = \frac{3}{5}$$

46) $\tan\left(\cos^{-1}\left(\frac{4}{5}\right)\right) =$

Solution:

Let $\alpha = \cos^{-1}\left(\frac{4}{5}\right)$

$\cos\alpha = \frac{4}{5} = \frac{adj}{hyp}$

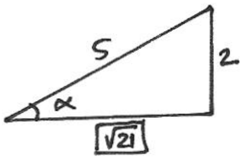
Now, we should find the length of the opposite side using the Pythagorean Theorem, so

$|\text{opposite}| = \sqrt{5^2 - 4^2} = \sqrt{25-16} = \sqrt{9} = 3$

$$\therefore \tan\left(\cos^{-1}\left(\frac{4}{5}\right)\right) = \tan(\alpha) = \frac{opp}{adj} = \frac{3}{4}$$

47) $\sin\left(2\sin^{-1}\left(\frac{2}{5}\right)\right) =$

Solution:



Let $\alpha = \sin^{-1}\left(\frac{2}{5}\right)$

$\sin\alpha = \frac{2}{5} = \frac{opp}{hyp}$

Now, we should find the length of the adjacent side using the Pythagorean Theorem, so

$|\text{adjacent}| = \sqrt{5^2 - 2^2} = \sqrt{25-4} = \sqrt{21}$

$$\sin\left(2\sin^{-1}\left(\frac{2}{5}\right)\right) = \sin(2\alpha)$$

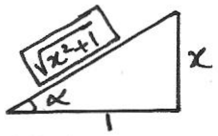
Now, use the identity $\sin(2x) = 2\sin x.\cos x$. Thus,

$$\sin\left(2\sin^{-1}\left(\frac{2}{5}\right)\right) = \sin(2\alpha) = 2\sin(\alpha)\cos(\alpha)$$

$$= 2 \times \frac{2}{5} \times \frac{\sqrt{21}}{5} = \frac{4\sqrt{21}}{25}$$

48) $\cos(\tan^{-1} x) =$

Solution:



Let $\alpha = \tan^{-1} x$

$\tan\alpha = x = \frac{opp}{adj}$

Now, we should find the length of the hypotenuse side using the Pythagorean Theorem, so

$|\text{hypotenuse}| = \sqrt{x^2 + 1^2} = \sqrt{x^2+1}$

$$\cos(\tan^{-1} x) = \cos(\alpha) = \frac{adj}{hyp} = \frac{1}{\sqrt{x^2+1}}$$

49) $\sin(\tan^{-1} x) =$

Solution:

Let $\alpha = \tan^{-1} x$

$\tan\alpha = x = \frac{opp}{adj}$

Now, we should find the length of the hypotenuse side using the Pythagorean Theorem, so

$|\text{hypotenuse}| = \sqrt{x^2 + 1^2} = \sqrt{x^2+1}$

$$\sin(\tan^{-1} x) = \sin(\alpha) = \frac{opp}{hyp} = \frac{x}{\sqrt{x^2+1}}$$

50) $\csc(\tan^{-1} x) =$

Solution:

Let $\alpha = \tan^{-1} x$

$\tan\alpha = x = \frac{opp}{adj}$

Now, we should find the length of the hypotenuse side using the Pythagorean Theorem, so

$|\text{hypotenuse}| = \sqrt{x^2 + 1^2} = \sqrt{x^2+1}$

$$\csc(\tan^{-1} x) = \csc(\alpha) = \frac{1}{\sin\alpha} = \frac{hyp}{opp} = \frac{\sqrt{x^2+1}}{x}$$

51) $\sec(\tan^{-1} x) =$

Solution:

Let $\alpha = \tan^{-1} x$

$\tan\alpha = x = \frac{opp}{adj}$

Now, we should find the length of the hypotenuse side using the Pythagorean Theorem, so

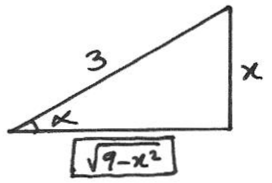
$|\text{hypotenuse}| = \sqrt{x^2 + 1^2} = \sqrt{x^2 + 1}$

$$\sec(\tan^{-1} x) = \sec(\alpha) = \frac{1}{\cos\alpha} = \frac{hyp}{adj} = \frac{\sqrt{x^2+1}}{1} = \sqrt{x^2+1}$$

52) $\sec\left(\sin^{-1}\frac{x}{3}\right) =$

Solution:

Let $\alpha = \sin^{-1}\frac{x}{3}$



$\sin\alpha = \frac{x}{3} = \frac{opp}{hyp}$

Now, we should find the length of the adjacent side using the Pythagorean Theorem, so

$|\text{adjacent}| = \sqrt{3^2 - x^2} = \sqrt{9 - x^2}$

$$\sec\left(\sin^{-1}\frac{x}{3}\right) = \sec(\alpha) = \frac{1}{\cos\alpha} = \frac{hyp}{adj} = \frac{3}{\sqrt{9-x^2}}$$

53) $\cot\left(\sin^{-1}\frac{x}{3}\right) =$

Solution:

Let $\alpha = \sin^{-1}\frac{x}{3}$

$\sin\alpha = \frac{x}{3} = \frac{opp}{hyp}$

Now, we should find the length of the adjacent side using the Pythagorean Theorem, so

$|\text{adjacent}| = \sqrt{3^2 - x^2} = \sqrt{9 - x^2}$

$$\cot\left(\sin^{-1}\frac{x}{3}\right) = \cot(\alpha) = \frac{1}{\tan\alpha} = \frac{adj}{opp} = \frac{\sqrt{9-x^2}}{x}$$

54) $\tan\left(\sin^{-1}\frac{x}{3}\right) =$

Solution:

Let $\alpha = \sin^{-1}\frac{x}{3}$

$\sin\alpha = \frac{x}{3} = \frac{opp}{hyp}$

Now, we should find the length of the adjacent side using the Pythagorean Theorem, so

$|\text{adjacent}| = \sqrt{3^2 - x^2} = \sqrt{9 - x^2}$

$$\tan\left(\sin^{-1}\frac{x}{3}\right) = \tan(\alpha) = \frac{1}{\cot\alpha} = \frac{opp}{adj} = \frac{x}{\sqrt{9-x^2}}$$

55) $\cos\left(\sin^{-1}\frac{x}{3}\right) =$

Solution:

Let $\alpha = \sin^{-1}\frac{x}{3}$

$\sin\alpha = \frac{x}{3} = \frac{opp}{hyp}$

Now, we should find the length of the adjacent side using the Pythagorean Theorem, so

$|\text{adjacent}| = \sqrt{3^2 - x^2} = \sqrt{9 - x^2}$

$$\cos\left(\sin^{-1}\frac{x}{3}\right) = \cos(\alpha) = \frac{adj}{hyp} = \frac{\sqrt{9-x^2}}{3}$$