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BMT223 Assignment #2

Find the derivative of:

$$f(x) = \frac{(x^{40})(x+2)^5}{(x^7+3)^7}$$

Answer:

By using Logarithmic differentiation method:

$$F(x) = \ln(f(x)) = \ln\left(\frac{(x^{40})(x+2)^5}{(x^7+3)^7}\right) = \ln(x)^{40} + \ln(x+2)^5 - \ln(x^7+3)^7$$

$$F(x) = 40 \ln(x) + 5 \ln(x+2) - 7 \ln(x^7+3)$$

$$F'(x) = \frac{40}{x} + \frac{5}{x+2} - \frac{49x^6}{x^7+3} = \frac{40(x+2)(x^7+3) + 5(x)(x^7+3) - 49x^7(x+2)}{(x)(x+2)(x^7+3)}$$

$$F'(x) = \frac{(x+2)(40(x^7+3)) - 49x^7 + 5x(x^7+3)}{(x)(x+2)(x^7+3)}$$

$$F'(x) = \frac{f'(x)}{f(x)}, \quad f'(x) = (F'(x))(f(x))$$

$$f'(x) = \left(\frac{(x+2)(40(x^7+3)) - 49x^7 + 5x(x^7+3)}{(x)(x+2)(x^7+3)}\right) \left(\frac{(x^{40})(x+2)^5}{(x^7+3)^7}\right)$$

$$f'(x) = \frac{(x^{39})(x+2)^5(-9x^7+120) + 5x^{40}(x+2)^4(x^7+3)}{(x^7+3)^8}$$