

5.1, 5.3 Morning Quiz Review

Differentiate each function with respect to x .

1) $f(x) = \ln\left(\frac{2x^2}{4x^5 + 1}\right)^2$

A) $f'(x) = \frac{4x^5 + 1 - 2x^2}{x^2(4x^5 + 1)}$

B) $f'(x) = \frac{5x^3 - 1}{10x^4}$

C) $f'(x) = \frac{4(-6x^5 + 1)}{x(4x^5 + 1)}$

D) $f'(x) = 2(2x^2 - 4x^5 - 1)$

2) $y = \ln\left(\frac{x^2}{3x^4 + 4}\right)^5$

A) $\frac{dy}{dx} = \frac{10(-3x^4 + 4)}{x(3x^4 + 4)}$

B) $\frac{dy}{dx} = \frac{5(3x^4 + 4 - x^2)}{x^2(3x^4 + 4)}$

C) $\frac{dy}{dx} = 5(x^2 - 3x^4 - 4)$

D) $\frac{dy}{dx} = \frac{5(6x^2 - 1)}{12x^3}$

Use logarithmic differentiation to differentiate each function with respect to x .

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

A) $\frac{dy}{dx} = y \cdot \frac{25x^4}{3x^5 + 6}$

B) $\frac{dy}{dx} = y \cdot \frac{5x^4}{3x^5 + 6}$

C) $\frac{dy}{dx} = y \cdot \frac{20x^4}{3x^5 + 6}$

D) $\frac{dy}{dx} = y \cdot \frac{10x^4}{3x^5 + 6}$

4) $y = 5x^{2x}$

A) $\frac{dy}{dx} = y(8 \ln x + 8)$

B) $\frac{dy}{dx} = y(6 \ln x + 6)$

C) $\frac{dy}{dx} = y(4 \ln x + 4)$

D) $\frac{dy}{dx} = y(2 \ln x + 2)$

For each problem, find $(f^{-1})'(a)$

5) $f(x) = 2x^7 + 2x + 4, a = 8$

A) $(f^{-1})'(a) = \frac{1}{24}$

B) $(f^{-1})'(a) = \frac{1}{6}$

C) $(f^{-1})'(a) = \frac{1}{16}$

D) $(f^{-1})'(a) = \frac{1}{21}$

6) $f(x) = 4x^3 + 3x + 2, a = 2$

A) $(f^{-1})'(a) = \frac{1}{6}$

B) $(f^{-1})'(a) = \frac{1}{3}$

C) $(f^{-1})'(a) = \frac{1}{9}$

D) $(f^{-1})'(a) = \frac{1}{5}$

For each problem, find the equation of the line tangent to the function at the given point. Your answer should be in slope-intercept form.

7) $f(x) = \ln(x+1)$ at $(1, \ln 2)$

A) $y = \frac{1}{2}x + \frac{2 \ln 2 - 1}{2}$

B) $y = x$

C) $y = -2x - 1$

D) $y = x + 3$

8) Find Domain and Range for
 $y = \ln(2x-6) - 5$

5.1-5.3 Morning Quiz Review Solutions

$$1) f(x) = \ln\left(\frac{2x^2}{4x^5+1}\right)^2$$

$$f(x) = 2\ln\left(\frac{2x^2}{4x^5+1}\right)$$

$$f(x) = 2\ln(2x^2) - 2\ln(4x^5+1)$$

$$f'(x) = 2\left(\frac{4x}{2x^2}\right) - 2\left(\frac{20x^4}{4x^5+1}\right)$$

$$f'(x) = \frac{4}{x} - \frac{40x^4}{4x^5+1} \quad \boxed{C}$$

$$2) y = \ln\left(\frac{x^2}{3x^4+4}\right)^5 \quad y = 5\ln\left(\frac{x^2}{3x^4+4}\right)$$

$$y = 5\ln x^2 - 5\ln(3x^4+4)$$

$$y = 10\ln x - 5\ln(3x^4+4)$$

$$y' = 10\left(\frac{1}{x}\right) - 5\left(\frac{12x^3}{3x^4+4}\right) = \frac{10}{x} - \frac{60x^3}{3x^4+4} \quad \boxed{A}$$

$$4) y = 5x^{2x}$$

$$\ln y = \ln[5x^{2x}]$$

$$\ln y = \ln 5 + \ln x^{2x}$$

$$\ln y = \ln 5 + (2x)(\ln x)$$

$$\frac{1}{y}\left(\frac{dy}{dx}\right) = 0 + 2\ln x + 2x\left(\frac{1}{x}\right)$$

$$\frac{dy}{dx} = y[2\ln x + 2]$$

$$\frac{dy}{dx} = 5x^{2x}[2\ln x + 2] \quad \boxed{D}$$

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

$$\ln y = \ln(x^5+2)^{1/3}$$

$$\ln y = \frac{1}{3}\ln(x^5+2)$$

$$\frac{1}{y}\left(\frac{dy}{dx}\right) = \frac{1}{3}\left(\frac{5x^4}{x^5+2}\right)$$

$$\frac{dy}{dx} = y\left(\frac{5x^4}{3x^5+6}\right) = \frac{\sqrt[3]{x^5+2}(5x^4)}{3x^5+6} \quad \boxed{B}$$

$$5) f(x) = 2x^7 + 2x + 4 \quad \text{find } g'(8)$$

$$f(1) = 8 \quad g(8) = 1$$

$$f'(1) = 16 \quad g'(8) = \frac{1}{16}$$

$$f'(x) = 14x^6 + 2$$

$$f'(1) = 14(1)^6 + 2 = 16$$

$$8 = 2x^7 + 2x + 4$$

$$0 = 2x^7 + 2x - 4$$

$$x = 1$$

$$g'(8) = \frac{1}{16} \quad \boxed{A}$$

$$6) f(x) = 4x^3 + 3x + 2 \quad \text{find } g'(2)$$

$$f(0) = 2 \quad g(2) = 0 \quad 2 = 4x^3 + 3x + 2$$

$$f'(0) = 3 \quad g'(2) = \frac{1}{3} \quad 0 = 4x^3 + 3x$$

$$f'(x) = 12x^2 + 3$$

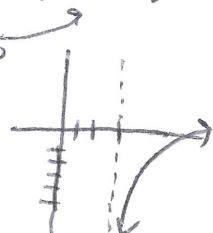
$$f'(0) = 3$$

$$g'(2) = \frac{1}{3} \quad \boxed{g'(2) = \frac{1}{3}}$$

$$8) y = \ln(2x-6) - 5$$

$$2x-6=0$$

$$x=3$$



$$D: (3, \infty)$$

$$R: (-\infty, \infty)$$

$$7) f(x) = \ln(x+1) \quad \text{at } (1, \ln 2)$$

$$f'(x) = \frac{1}{x+1} \quad f'(1) = \frac{1}{2} \quad \begin{cases} y - \ln 2 = \frac{1}{2}(x-1) \\ y = \frac{1}{2}x - \frac{1}{2} + \ln 2 \end{cases}$$