

Quiz 3.3 Review

In each problem, find the indicated derivative with respect to x . Be sure to simplify all negative exponents.

1. $y = \frac{36}{x^5}$, find $\frac{dy}{dx}$. $y = 36x^{-5}$

$$\frac{dy}{dx} = -180x^{-6}$$

$$= \frac{-180}{x^6}$$

2. $y = \sqrt{13}$, find $\frac{dy}{dx}$. $y = \sqrt{13}$

$$\frac{dy}{dx} = 0$$

3. $y = -x^5 + x^2 - 3x$, find $\frac{d^5y}{dx^5}$.

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

$$f'' = -20x^3 + 2$$

$$f''' = -60x^2$$

$$f^{(4)} = -120x$$

$$f^{(5)} = -120$$

4. $y = \sqrt[3]{x} + \sqrt{x} - 2x$, find $\frac{dy}{dx}$.

$$\frac{dy}{dx} = \frac{1}{3}x^{-2/3} + \frac{1}{2}x^{-1/2} - 2$$

$$\frac{1}{3\sqrt[3]{x^2}} + \frac{1}{2\sqrt{x}} - 2$$

5. $y = 6x^3 + 12$, find $\frac{dy}{dx}$. Then find $\frac{dy}{dx}|_{x=-2}$

$$\frac{dy}{dx} = 18x^2$$

$$\frac{dy}{dx}|_{x=-2} = 18(-2)^2$$

$$72$$

6. $y = \frac{4}{x^2} + x - 2$, find $\frac{dy}{dx}$. Then find $\frac{dy}{dx}|_{x=1}$

$$y = 4x^{-2} + x - 2$$

$$\frac{dy}{dx} = -8x^{-3} + 1 = \frac{-8}{x^3} + 1$$

$$\frac{dy}{dx}|_{x=1} = \frac{-8}{(1)} + 1 = -7$$

7. $y = 40x^{\frac{1}{4}}$, find $\frac{dy}{dx}$.

$$40 \cdot \frac{1}{4}$$

$$\frac{dy}{dx} = 10x^{-3/4} = \frac{10}{\sqrt[4]{x^3}}$$

8. $f(x) = x^5 + x^2$, find f'' . Then find $f''(-3)$.

$$f'(x) = 5x^4 + 2x$$

$$f''(x) = 20x^3 + 2$$

$$f''(-3) = 20(-3)^3 + 2 = -538$$

9. $y = \frac{2}{3x^{10}}$, Find $\frac{dy}{dx}$. $y = \frac{2}{3}x^{-10}$

$$\frac{dy}{dx} = \frac{-20}{3}x^{-11} = \frac{-20}{3x^{11}}$$

10. $y = \frac{x^3}{\sqrt[5]{x}}$, Find $\frac{dy}{dx}$

$$= x^3 \cdot x^{-1/5} = x^{14/5}$$

$$\frac{dy}{dx} = \frac{14}{5}x^{9/5}$$

11. $y = \frac{2x^2 - x}{x}$ Find $\frac{dy}{dx}$

$$\frac{dy}{dx} = \frac{x \frac{d}{dx} [2x^2 - x] - (2x^2 - x) \frac{d}{dx} [x]}{x^2}$$

$$= \frac{x(4x - 1) - (2x^2 - x)(1)}{x^2}$$

$$\frac{4x^2 - x - 2x^2 + x}{x^2} = \frac{2x^2}{x^2} = 2$$

12. $y = -x^2(x^3 + 1)$ Find $\frac{dy}{dx}$

$$\frac{dy}{dx} = -x^5 - x^2$$

$$-5x^4 - 2x$$

$$-x^2 \frac{d}{dx} [x^3 + 1] + (x^3 + 1) \frac{d}{dx} [-x^2]$$

$$-x^2(3x^2) + (x^3 + 1)(-2x)$$

$$-3x^4 - 2x^4 - 2x$$

13. $y = (x^3 - 1)(x^2 + 5)$ Find $\frac{dy}{dx}$

$$(x^3 - 1) \frac{d}{dx} (x^2 + 5) + (x^2 + 5) \frac{d}{dx} (x^3 - 1)$$

$$(x^3 - 1)(2x) + (x^2 + 5)(3x^2)$$

$$2x^4 - 2x + 3x^4 + 15x^2$$

$$5x^4 + 15x^2 - 2x$$

14. $y = \frac{2x+1}{x^2+3x}$ Find $\frac{dy}{dx}$

$$\frac{dy}{dx} = \frac{(x^2+3x) \frac{d}{dx} [2x+1] - (2x+1) \frac{d}{dx} [x^2+3x]}{(x^2+3x)^2}$$

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

$$\frac{2x^2+6x - (4x^2+6x+2x+3)}{(x^2+3x)^2}$$

$$\frac{-2x^2 - 2x - 3}{x^4 + 6x^3 + 9x^2}$$

15. Find $\frac{d^3y}{dx^3}$ if $y = x^{-3} + 2x^2$. Then find $\frac{d^3y}{dx^3} \Big|_{x=-2}$

$$\frac{dy}{dx} = -3x^{-4} + 4x$$

$$y'' = 12x^{-5} + 4$$

$$y''' = -60x^{-6}$$

$$\frac{-60}{x^6}$$

$$\frac{-60}{(-2)^6} = \frac{-60}{64}$$

16. Find $\frac{dy}{dx}$ if $y = \frac{5x^3 - 4x^2 + 1}{x^{\frac{4}{3}} - 2}$

$$(x^{\frac{4}{3}} - 2) \frac{d}{dx} [5x^3 - 4x^2 + 1] - (5x^3 - 4x^2 + 1) \frac{d}{dx} [x^{\frac{4}{3}} - 2]$$

$$(x^{\frac{4}{3}} - 2)^2$$

$$(x^{\frac{4}{3}} - 2)(15x^2 - 8x) - (5x^3 - 4x^2 + 1) \left(\frac{4}{3}x^{\frac{1}{3}}\right)$$