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12.3

1) a) x^5

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

b) x^{-6}

$$f'(x) = -6x^{-7}$$

c) $\sqrt{x} = x^{1/2}$

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

d) $\frac{1}{\sqrt[4]{x}} = x^{-1/4}$

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

2) a) $5x^4$

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

b) $5x^{-2}$

$$\frac{dy}{dx} = -10x^{-3}$$

c) $\frac{3x^2}{12x^5} = \frac{1}{4}x^{-3}$

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

d) $\frac{9}{\sqrt[3]{x^2}} = 9x^{-2/3}$

$$\frac{dy}{dx} = -6x^{-5/3}$$

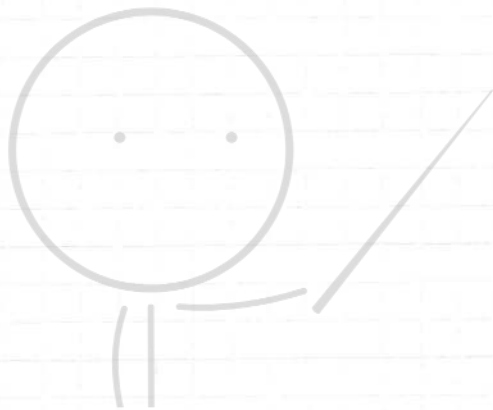
3) $y = 2x^3$ $\frac{dy}{dx} = 6x^2$

a) $6(3)^2 = 54$

c) $6\left(\frac{1}{2}\right)^2 = \frac{3}{2}$

b) $6(-5)^2 = 150$

d) $6\left(\frac{3}{4}\right)^2 = \frac{27}{8}$



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$$4) y = \frac{5}{x^3} = 5(x^{-3}) = 5x^{-3}$$

$$\frac{dy}{dx} = -15x^{-4}$$

$$-15(2)^{-4} = -\frac{15}{16}$$

$$5) y = -\frac{8}{\sqrt{x}} = -8(x^{-1/2}) = -8x^{-1/2}$$

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

When $x=16$,

$$\frac{dy}{dx} = 4(16)^{-3/2} = \underline{\underline{\frac{1}{16}}}$$

$$6) y = 2x^4 \quad x = 9 \quad y = 27$$

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

$$8x^3 = 27$$

$$x = \sqrt[3]{27} = 3$$

$$7) y^3 - 64x^2 = 0$$

$$y \geq 0$$

$$y = \sqrt[3]{64x^2}$$

$$y = 4x^{2/3}$$

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

$$\frac{8}{3}(27)^{-1/3} = \text{gradient} = \underline{\underline{\frac{8}{9}}}$$

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