

Activity 1: Basic Differentiation Rules

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1. Page 111-13

Differentiate the function.

$$1. \quad f(x) = 2^{40}$$

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

$$2. \quad f(x) = 5.2x + 2.3$$

$$\frac{dy}{dx} = 5.2$$

$$3. \quad f(t) = 2t^3 - 3t^2 - 4t$$

$$\frac{dy}{dx} = 6t^2 - 6t - 4$$

$$4. \quad g(x) = x^2(1 - 2x)$$

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

$$= (2x^2) + (2x - 4x^2)$$

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

$$5. \quad g(t) = 2t^{\frac{-3}{4}}$$

$$\frac{dy}{dx} = \frac{-3}{2} t^{\frac{-7}{4}}$$

$$6. \quad -$$

$$7. \quad -$$

$$8. \quad -$$

$$9. \quad -$$

$$10. \quad -$$

$$11. \quad -$$

$$12. \quad -$$

Differentiate.

$$13. \quad f(x) = (5x^2 - 2)(x^3 + 3x)$$

$$= 5x^5 + 15x^3 - 2x^3 - 6x$$

$$= 5x^5 + 13x^3 - 6x$$

$$\frac{dy}{dx} = 25x^4 + 39x^2 - 6$$

$$14. \quad B(u) = (u^3 + 1)(2u^2 - 4u - 1)$$

$$= 2u^5 - 4u^4 - u^3 + 2u^2 - 4u - 1$$

$$= 2u^5 - 4u^4 - u^3 + 2u^2 - 4u - 1$$

$$\frac{dy}{dx} = 10u^4 - 16u^3 - 3u^2 + 4u - 4$$

15. –

16. –

$$\begin{aligned} 17. \quad g(x) &= \frac{1+2x}{3-4x} \\ &= \frac{(3-4x)(2) - (1+2x)(-4)}{(3-4x)^2} \\ &= \frac{(6-8x) - (-4-8x)}{(3-4x)^2} \\ &= \frac{6-8x+4+8x}{(3-4x)^2} \\ \frac{dy}{dx} &= \frac{10}{(3-4x)^2} \end{aligned}$$

18. –

$$\begin{aligned} 19. \quad y &= \frac{t^3+3t}{t^2-4t+3} \\ &= \frac{(t^2-4t+3)(3t^2+3) - (t^3+3t)(2t-4)}{(t^2-4t+3)^2} \\ &= \frac{(3t^4+3t^2-12t^3-12t+9t^2+9) - (2t^4-4t^3+6t^2-12t)}{(t^2-4t+3)^2} \\ &= \frac{3t^4+3t^2-12t^3-12t+9t^2+9-2t^4+4t^3-6t^2+12t}{(t^2-4t+3)^2} \\ \frac{dy}{dx} &= \frac{t^4-8t^3+6t^2+9}{(t^2-4t+3)^2} \end{aligned}$$

$$\begin{aligned} 20. \quad y &= \frac{s-\sqrt{s}}{s^2} \\ &= \frac{(s^2)(1-\frac{1}{2}s^{-\frac{1}{2}}) - (s-s^{\frac{1}{2}})(2s)}{s^4} \\ &= \frac{(s^2-\frac{1}{2}s^{\frac{3}{2}}) - (2s^2-2s^{\frac{3}{2}})}{s^4} \\ &= \frac{s^2-\frac{1}{2}s^{\frac{3}{2}}-2s^2+2s^{\frac{3}{2}}}{s^4} \\ &= \frac{\frac{1}{2}s^{\frac{3}{2}}-s^2}{s^4} \\ &= \frac{s^2(\frac{1}{2}s^{\frac{1}{2}}-1)}{s^4} \\ \frac{dy}{dx} &= \frac{\frac{1}{2}s^{\frac{1}{2}}-1}{s^2} \end{aligned}$$

2. Find the derivative of $f(x) = (x^2 + 2)^2(x^4 + 4)^4$.

$$\frac{dv}{dx} = (4)(4x^3)(x^4 + 4)^3$$

$$\frac{du}{dx} = (2)(2x)(x^2 + 2)$$

$$= v\left(\frac{du}{dx}\right) + u\left(\frac{dv}{dx}\right)$$

$$= [(4)(4x^3)(x^2 + 2)^2(x^4 + 4)^3] + [(2)(2x)(x^4 + 4)^4(x^2 + 2)]$$

$$= (2)(2x)(x^2 + 2)(x^4 + 4)^3[(2)(2x^2)(x^2 + 2) + (x^4 + 4)]$$

$$= 4x(x^2 + 2)(x^4 + 4)^3[4x^2(x^2 + 2) + (x^4 + 4)]$$

$$\frac{dy}{dx} = 4x^3 + 8x(x^4 + 4)^3[4x^4 + 8x^2 + (x^4 + 4)]$$