

2.2 Basic Differentiation Rules

Pg. 114 #'s 3-22, 31, 44, 57, 61, 63

$$3) y = 12$$
$$y' = 0$$

$$4) f(x) = -9$$
$$f'(x) = 0$$

$$5) y = x^7$$
$$y' = 7x^6$$

$$6) y = x^{12}$$
$$y' = 12x^{11}$$

$$7) y = \frac{1}{x^5}$$
$$y = x^{-5}$$
$$y' = -5x^{-6}$$
$$y' = \frac{-5}{x^6}$$

$$8) y = \frac{3}{x^9}$$
$$y = 3x^{-9}$$
$$y' = -27x^{-10}$$
$$y' = \frac{-27}{x^{10}}$$

$$9) f(x) = \sqrt[5]{x}$$
$$f(x) = x^{1/5}$$
$$f'(x) = \frac{1}{5}x^{-4/5}$$
$$f'(x) = \frac{1}{5\sqrt[5]{x^4}}$$

$$10) g(x) = \sqrt[4]{x}$$
$$g(x) = x^{1/4}$$
$$g'(x) = \frac{1}{4}x^{-3/4}$$
$$g'(x) = \frac{1}{4\sqrt[4]{x^3}}$$

$$11) f(x) = x + 11$$
$$f'(x) = 1$$

$$12) g(x) = 6x + 3$$
$$g'(x) = 6$$

$$13) f(t) = -2t^2 + 3t - 6$$
$$f'(t) = -4t + 3$$

$$14) y = t^2 - 3t + 1$$
$$y' = 2t - 3$$

$$15) g(x) = x^2 + 4x^3$$
$$g'(x) = 2x + 12x^2$$

$$16) y = 4x - 3x^3$$
$$y' = 4 - 9x^2$$

$$17) s(t) = t^3 + 5t^2 - 3t + 8$$
$$s'(t) = 3t^2 + 10t - 3$$

$$18) y = 2x^3 + 6x^2 - 1$$
$$y' = 6x^2 + 12x$$

$$19) y = \frac{\pi}{2} \sin \theta - \cos \theta$$
$$y' = \frac{\pi}{2} \cos \theta + \sin \theta$$

$$20) g(t) = \pi \cos t$$
$$g'(t) = -\pi \sin t$$

$$21) y = x^2 - \frac{1}{2} \cos x$$

$$y' = 2x + \frac{1}{2} \sin x$$

$$22) y = 7 + \sin x$$

$$y' = \cos x$$

$$31) f(x) = \frac{8}{x^2}$$

$$f(x) = 8x^{-2}$$

$$f'(x) = -16x^{-3}$$

$$f'(x) = \frac{-16}{x^3}$$

$$f'(2) = \frac{-16}{2^3} = -2$$

$$44) f(x) = \frac{2x^4 - x}{x^3}$$

$$f(x) = 2x - x^{-2}$$

$$f'(x) = 2 + 2x^{-3}$$

$$f'(x) = 2 + \frac{2}{x^3}$$

$$57) y = x^4 - 2x^2 + 3$$

$$y' = 4x^3 - 4x$$

$$0 = 4x(x^2 - 1)$$

$$4x = 0 \quad x^2 - 1 = 0$$

$$x = 0 \quad x = 1 \quad x = -1$$

$$61) y = x + \sin x, \quad 0 \leq x \leq 2\pi$$

$$y' = 1 + \cos x$$

$$0 = 1 + \cos x$$

$$\cos x = -1$$

$$x = \pi$$

$$63) f(x) = k - x^2$$

$$y = -6x + 1$$

$$f'(x) = -2x$$

$$-6 = -2x$$

$$3 = x$$

$$y = -6(3) + 1$$

$$y = -18 + 1$$

$$y = -17$$

$$f(3) = k - (3)^2$$

$$-17 = k - 9$$

$$-8 = k$$