

SECTION 3.1 DERIVATIVES OF POLYNOMIALS AND  $e^x$

1. Fill in the derivative rules:

$$(a) \frac{d}{dx}[c] = 0 \quad y=5, y'=0$$

$$(b) \frac{d}{dx}[x^n] = nx^{n-1} \quad y=x^{50}, y'=50x^{49}$$

$$(c) \frac{d}{dx}[cf(x)] = c \frac{d}{dx}[f(x)] \quad y=10x^5, y'=10 \cdot 5 \cdot x^4 = 50x^4$$

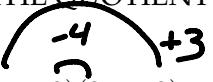
$$(d) \frac{d}{dx}[f(x) + g(x)] = \frac{d}{dx}[f(x)] + \frac{d}{dx}[g(x)] \quad y=3x^2+x, y'=6x+1$$

$$(e) \frac{d}{dx}[f(x) - g(x)] = \frac{d}{dx}[f(x)] - \frac{d}{dx}[g(x)] \quad y=3x^2-x, y'=6x-1$$

$$(f) \frac{d}{dx}[e^x] = e^x \quad y=4e^x+5, y'=4e^x$$

2. Compute derivatives of the following functions using derivative rules. DO NOT USE THE PRODUCT RULE, THE QUOTIENT RULE OR THE CHAIN RULE.

$$(a) f(x) = (x-2)(2x+3)$$



$$f'(x) = 4x-1$$

$$= 2x^2 - x - 6$$

$$(b) g(x) = \frac{x^2}{2} - \frac{2}{x^2} + \frac{1}{\sqrt{2}}$$

$$g'(x) = x + 4x^{-3}$$

$$= \frac{1}{2}x^2 - 2x^{-2} + \frac{1}{12}$$

$$(c) f(t) = \sqrt{t} - e^t + t^{0.3}$$

$$= t^{\frac{1}{2}} - e^t + t^{0.3}$$

$$f'(t) = \frac{1}{2}t^{-\frac{1}{2}} - e^t + 0.3t^{-0.7}$$

$$(d) f(x) = \frac{x^2 + x - 1}{\sqrt{x}}$$

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

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

$$(e) V(r) = \frac{4}{3}\pi r^3$$

$$V'(r) = 4\pi r^2$$

$$(f) f(x) = e^{x-3}$$

$$= e^3 \cdot e^x$$

$$f'(x) = e^3 \cdot e^x = e^{x-3}$$

$$(g) H(r) = ar^2 + br + c$$

$$H'(r) = 2ar^2 + b$$

3. At what point(s) on the curve  $y = 3x + x^3$  is the tangent to the curve parallel to the line  $y = 6x - 5$ ?

$$y' = 3 + 3x^2 = 6$$

$$x^2 = 1$$

$$x = \pm 1$$

$$\text{points: } (1, 4)$$

$$(-1, -4)$$