

### 23.5 Derivatives of Polynomials

$$f(x) = c \Rightarrow f'(x) = 0$$

$$f(x) = x^n \Rightarrow f'(x) = nx^{n-1}$$

$$f(x) = x^2 \Rightarrow f'(x) = 2x^{2-1} = 2x \quad f(x) = x^6 \Rightarrow f'(x) = 6x^{6-1} = 6x^5$$

$$f(x) = c \cdot u(x) \Rightarrow f'(x) = c \cdot u'(x)$$

$$f(x) = 4x^5 \Rightarrow f'(x) = 4(x^5)' = 4(5x^{5-1}) = 20x^4$$

$$f(x) = u(x) \pm v(x) \Rightarrow f'(x) = u'(x) \pm v'(x)$$

Works for more than 2 functions.

$$f(x) = x^3 + 3 \Rightarrow f'(x) = 3x^2 + 0 = 3x^2$$

$$y = f(x) \quad f'(x) = \frac{dy}{dx} = D_x(f(x)) = y'$$

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$$\textcircled{8} \quad y = -7x^6 \Rightarrow y' = -7(6x^{6-1}) = -42x^5$$

$$\textcircled{10} \quad s = 3t^5 + 4 \Rightarrow s' = 3(5t^4) + 0 = 15t^4 \quad x^0 = 1$$

$$\textcircled{14} \quad y = 6x^2 - 6x + 5 \Rightarrow y' = 6(2x) - 6(1x^{1-1}) + 0 = 12x - 6$$

$$\textcircled{18} \quad y = 13x^4 - 6x^3 - x - 1 \Rightarrow y' = 13(4x^3) - 6(3x^2) - (1) - 0 = 52x^3 - 18x^2 - 1$$

$$\textcircled{20} \quad f(z) = -\frac{1}{4}z^8 + \frac{1}{2}z^4 - 2^3 \Rightarrow f'(z) = -\frac{1}{4}(8z^7) + \frac{1}{2}(4z^3) + 0 = -2z^7 + 2z^3$$

②④  $y = x^4 - 9x^2 - 5x$   
Derivative at  $(3, -15)$

$$\Rightarrow y' = 4x^3 - 18x - 5$$

$$y'(3) = 4(3)^3 - 18(3) - 5 = 49$$

p. 669-670: 5-23 odd