

$$(4) f(x) = 3(1-x)^5$$

$$f'(x) = 15(1-x)^4(-1) = -15(1-x)^4$$

$$m_{\text{tan}} = f'(0) = -15$$

$$(2) (A) f'(x) = 3x(5x+2)^2(25x+4)$$

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

$$(A) f(x) = 3x^2(5x+2)^3 \quad \text{Use the product rule.}$$

$$\begin{aligned} f'(x) &= 3x^2 \cdot 3(5x+2)^2 \cdot 5 + (5x+2)^3 \cdot 6x \\ &= 3x(5x+2)^2 [15x + 2(5x+2)] \\ &= 3x(5x+2)^2(25x+4) \end{aligned}$$

$$(B) f(x) = \frac{x^2}{(3x-2)^2} \quad \text{Use the quotient rule.}$$

$$\begin{aligned} f'(x) &= \frac{(3x-2)^2 \cdot 2x - x^2 \cdot (2)(3x-2) \cdot 3}{(3x-2)^4} \\ &= \frac{2x(3x-2)[3x-2-3x]}{(3x-2)^4} \\ &= \frac{2x(-2)}{(3x-2)^3} = \frac{-4x}{(3x-2)^3} \end{aligned}$$

(F)

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

$$y = \frac{3}{\sqrt{x^2+1}} = \frac{3}{(x^2+1)^{1/2}} = 3(x^2+1)^{-1/2}$$

$$y' = 3\left(-\frac{1}{2}\right)(x^2+1)^{-3/2}(2x)$$

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

$$\frac{d}{dx}(u^n) = n \cdot u^{n-1} \cdot \frac{du}{dx}$$

$$\frac{d}{dx} \left( (4x^3+5x-7)^{83} \right)$$

$$= 83 \underbrace{(4x^3+5x-7)^{82}} \cdot (12x^2+5)$$

(E)

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

$$= -2(3x-4)^{-2}$$

$$y' = 4(3x-4)^{-3} \cdot 3 = \frac{12}{(3x-4)^3}$$

$$y = \frac{1}{\sqrt{2x^2+3}} = (2x^2+3)^{-1/2}$$

$$y' = -\frac{1}{2}(2x^2+3)^{-3/2} \cdot 4x$$

$n \leftarrow$  Exponent  
 $u \leftarrow$  Base

$$\textcircled{A} \quad y' = 32(8x-1)^3$$

$$\textcircled{B} \quad y' = 42x(x^2+8)^2$$

$$\textcircled{C} \quad y' = \frac{12x}{\sqrt{3x^2+2}}$$

$$\textcircled{D} \quad y' = \frac{-2}{(2x-3)^2}$$

$$\textcircled{B} \quad y = 7(x^2+8)^3$$

$$y' = 7 \cdot 3(x^2+8)^2 \cdot 2x = 42x(x^2+8)^2$$

$$\textcircled{C} \quad y = 4\sqrt{3x^2+2} = 4(3x^2+2)^{1/2}$$

$$y' = 4 \cdot \frac{1}{2}(3x^2+2)^{-1/2} \cdot 6x$$

$$\textcircled{3} \quad v(0) = 6$$

$$s = (2t+1)^3$$

$$v = 3(2t+1)^2 \cdot 2 = 6(2t+1)^2$$

$$v(0) = 6(2 \cdot 0 + 1)^2 \\ = 6 \cdot 1 = 6$$

HW7: Due 2/23

## Exam 2

① Velocity

Ⓐ Find  $\bar{v}$

$$s = 3t^2 - 2t + 1$$

HW3

Find  $\bar{v}$  between  $t=1$  and  $t=3$ .

$$s(1) = 3 - 2 + 1 = 2 \quad s(3) = 27 - 6 + 1 = 22$$

$$\bar{v} = \frac{\Delta s}{\Delta t} = \frac{22 - 2}{3 - 1} = \frac{20}{2} = 10$$

Ⓑ Find  $v$  (Use the rules for derivatives).

$$s = f(t)$$

$$v = \frac{ds}{dt} = f'(t)$$

$$s = 3t^2 - 2t + 1 \quad \text{Find } v(2).$$

$$v = 6t - 2$$

$$v(2) = 6 \cdot 2 - 2 = 10$$

② Compute a derivative using the definition.

$$f'(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$$

HW 4

③ HW 5  
Basic differentiation rules

④ HW 6  
Product and quotient rules

⑤ General power rule  
HW 7

⑥ If  $y = f(x)$ , then  $m_{\text{tan}} = f'(x)$ .

