

Name _____
Date _____ Hour _____

Pre-Calc
Derivatives Review

#1-2 Let C be a curve with equation $y = x^2 - 7x$

1. Use the definition of derivative to find the derivative of C. **SHOW ALL WORK!!**

2. Write and equation for the line tangent to C at P(3, -12)

3. Find the slope of the tangent line to the graph of $f(x) = x^3 + 3x - 2$ at $x = 2$

4. Find the equation of the tangent line in #3.

#5-6 Find $f'(x)$

5. $f(x) = 3x^2 - 4x + 9$

6. $f(x) = 7x^3 - 2x + 12$

#7-8 Find $f''(x)$

7. $f(x) = 2x^5 - 3x^3 + 8x$

8. $f(x) = (2x - 3)^2$

9. Find $\frac{dy}{dx}$ of $(5 - 3\sqrt{x})$

10. If $y = \frac{7x^2}{6x + 2}$, find $\frac{dy}{dx}$

11. If $y = (4x^2 - 3x)^5$, then $y' = \underline{\hspace{2cm}}$

12. If $f(x) = 8x - \frac{13}{x}$, find $f''(x)$

#13-15 Find $\frac{dy}{dx}$

13. $y = 3x^2 \sqrt{4x - 3}$

14. $y = (5 - 4x^2)^{\frac{4}{3}}$

15. $y = (5x^2 - 2)^5 (2x + 1)^4$

Derivatives Practice
Test answer key

#1 $y = x^2 - 7x$

$$\lim_{h \rightarrow 0} (x^2 - 7x) = \frac{\underbrace{f(x+h)}_{(x+h)^2 - 7(x+h)} - \underbrace{f(x)}_{x^2 - 7x}}{h}$$

$$\lim_{h \rightarrow 0} (y) = \frac{x^2 + 2xh + h^2 - 7x - 7h - x^2 + 7x}{h}$$

$$\lim_{h \rightarrow 0} (y) = \frac{2xh + h^2 - 7h}{h} \Rightarrow \frac{h(2x + h - 7)}{h}$$

$$\lim_{h \rightarrow 0} (y) = 2x + h - 7 = 2x + 0 - 7 = \boxed{2x - 7}$$

Definition

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

#2 $y' = 2x - 7$

derivative shows slope $\rightarrow f'(3) = 2(3) - 7$

M $= -1$

P(3, -12)

Point

Point Slope form

$$y + 12 = -1(x - 3)$$

$$\begin{array}{r} y + 12 = -x + 3 \\ -12 \quad -12 \\ \hline y = -x - 9 \end{array}$$

#3 $f(x) = x^3 + 3x - 2$

x = 2

#4 $f(2) = (2)^3 + 3(2) - 2$

$$f'(x) = 3x^2 + 3$$

$$f'(2) = 3(2)^2 + 3$$

$$= \boxed{15}$$

function shows y value

$$y - 12 = 15(x - 2)$$

$$y - 12 = 15x - 30$$

$$\begin{array}{r} +12 \quad +12 \\ \hline y = 15x - 18 \end{array}$$

#5 $f(x) = 3x^2 - 4x + 9$

$$f'(x) = \boxed{6x - 4}$$

#6 $f(x) = 7x^3 - 2x + 12$

$$f'(x) = \boxed{21x^2 - 2}$$

$$\#7 \quad f(x) = 2x^5 - 3x^3 + 8x$$

$$f'(x) = 10x^4 - 9x^2 + 8$$

$$f''(x) = 40x^3 - 18x$$

$$\#8 \quad f(x) = (2x-3)^2$$

$$f'(x) = (2)(2x-3)(2)$$

$$= 4(2x-3)$$

$$= 8x - 12$$

$$f''(x) = 8$$

$$u = 2x-3$$

$$du = 2$$

chain rule!

$$\#9 \quad \frac{dy}{dx} (5-3\sqrt{x}) = \frac{dy}{dx} (5-3(x)^{\frac{1}{2}})$$

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

$$\#10 \quad \frac{dy}{dx} \left(\frac{7x^2}{6x+2} \right) \frac{u}{v}$$

$$y' = \frac{(6x+2)(14x) - (7x^2)(6)}{(6x+2)^2}$$

$$y' = \frac{84x^2 + 28x - 42x^2}{(6x+2)^2} = \boxed{\frac{42x^2 + 28x}{(6x+2)^2}}$$

$$u = 7x^2 \quad v = 6x+2$$

$$du = 14x \quad dv = 6$$

$$\#11 \quad y = (4x^2 - 3x)^5$$

$$y' = 5(4x^2 - 3x)^4(8x - 3)$$

$$y' = (40x - 15)(4x^2 - 3x)^4$$

$$\#12 \quad f(x) = 8x - \frac{13}{x} = 8x - 13x^{-1}$$

$$f'(x) = 8 + 13x^{-2}$$

$$f''(x) = -26x^{-3} = \boxed{\frac{-26}{x^3}}$$

$$\#13 \quad y = 3x^2 \sqrt{4x-3} = (3x^2)(4x-3)^{\frac{1}{2}}$$

$$u = 3x^2 \quad v = \sqrt{4x-3}$$

$$du = 6x \quad dv = \frac{1}{2}(4x-3)^{-\frac{1}{2}}(4)$$

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

$$= \frac{6x^2}{\sqrt{4x-3}} + \frac{6x\sqrt{4x-3}}{1} \frac{\sqrt{4x-3}}{\sqrt{4x-3}} = \frac{6x^2 + 6x(4x-3)}{\sqrt{4x-3}} = \frac{6x^2 + 24x^2 - 18x}{\sqrt{4x-3}}$$

$$= \boxed{\frac{30x^2 - 18x}{\sqrt{4x-3}}}$$

chain rule!

#14 $y = (5-4x^2)^{\frac{4}{3}}$

$$u = 5-4x^2$$

$$du = -8x$$

$$y' = \frac{4}{3} (5-4x^2)^{\frac{1}{3}} (-8x)$$

$$= -\frac{32x}{3} (5-4x^2)^{\frac{1}{3}}$$

$$\boxed{-\frac{32x^3(5-4x^2)}{3}}$$

$$u = (5x^2-2)^5 \quad v = (2x+1)^4$$

$$du = 5(5x^2-2)^4(10x) \quad dv = 4(2x+1)^3(2)$$

#15 $y = (5x^2-2)^5 (2x+1)^4$

$$y' = (5x^2-2)^5 (4)(2x+1)^3(2) + (2x+1)^4 (5)(5x^2-2)^4 (10x)$$

$$\boxed{y' = 8(5x^2-2)^5 (2x+1)^3 + 50x (2x+1)^4 (5x^2-2)^4}$$

$$y' = 2 (5x^2-2)^4 (2x+1)^3 \left[4(5x^2-2) + 25x(2x+1) \right]$$

$$\left[20x^2-8 + 50x^2 + 25x \right]$$

$$\boxed{y' = 2 (5x^2-2)^4 (2x+1)^3 [70x^2 + 25x - 8]}$$

