Period 3, Sept 20,2024

$F(x) = a \cdot x^n$

$F'(x) = a \cdot n \cdot x^{n-1}$

$h(x) = F(x) \cdot g(x)$

$h'(x) = F'(x) \cdot g(x) + F(x) \cdot g'(x)$

$h(x) = \frac{F(x)}{g(x)}$

$h'(x) = \frac{F'(x) g(x) - F(x) \cdot g'(x)}{(g(x))^2}$

$h(x) = F(x) + g(x)$

$h'(x) = F'(x) + g'(x)$

$h(x) = F(x) - g(x)$

$h'(x) = F'(x) - g'(x)$

$F(x) = \underbrace{(3x^2 - 5x + 2)}(7x^4 - 3x^2)$

Slope of $F(x)$ at $x=1$

$F'(x) = (6x-5)(7x^4 - 3x^2) + (3x^2 - 5x + 2)(28x^3 - 6x)$

$F'(1) = (6(1)-5)(7(1)^4 - 3(1)^2) + (3(1)^2 - 5(1) + 2)(28(1)^3 - 6(1))$

$1 \cdot 4 + \quad 0 \cdot 22 = 4$

$F(x) = \underbrace{(5x^2 - 3x)}\underbrace{(7x^3 - 4)(12x^6 + 2x)}$

$F'(x) = (10x-3)\left[(7x^3-4)(12x^6+2x)\right] + (5x^2-3x)\left[21x^2 \cdot (12x^6+2x) + (7x^3-4)(72x^5+2)\right]$

$F'(x) = (10x-3)(7x^3-4)(12x^6+2x) + (5x^2-3x)(21x^2)(12x^6+2x) + (5x^2-3x)(7x^3-4)(72x^5+2)$

$F(x) = (5x^2 - 3x)(7x^3 - 4)(12x^6 + 2x)$

$F'(x) = (10x-3)(7x^3-4)(12x^6+2x) + (5x^2-3x)(21x^2)(12x^6+2x) + (5x^2-3x)(7x^3-4)(72x^5+2)$

$h(x) = F(x) \cdot g(x) \cdot P(x)$

$h'(x) = F'(x) \cdot g(x) \cdot P(x) + F(x) \cdot g'(x) \cdot P(x) + F(x) \cdot g(x) \cdot P'(x)$

$$h(x) = \frac{5x^4 - x^7 + 9x^2}{4x^3 - 8}$$

$$h'(x) = \frac{(20x^3 - 7x^6 + 18x)(4x^3-8) - (5x^4 - x^7 + 9x^2)(12x^2)}{(4x^3-8)^2}$$

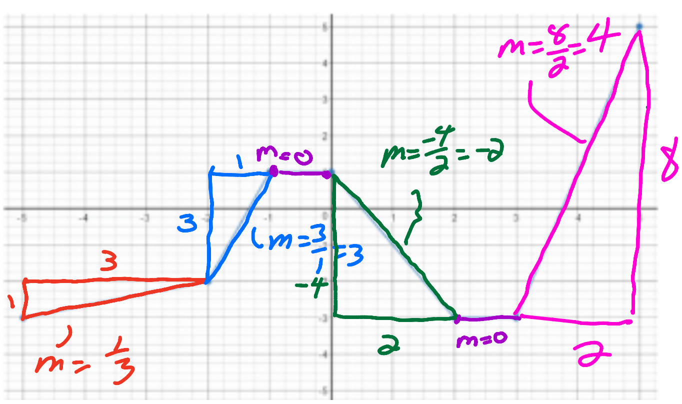
$$h'(1) = \frac{(20-7+18)(4-8) - (5-1+9)(12)}{(4-8)^2} = \frac{31 \cdot -4 - 13 \cdot 12}{(-4)^2}$$

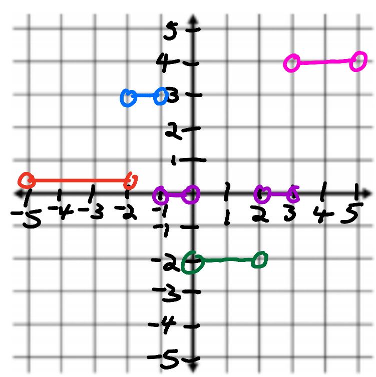
$$\frac{-124-156}{16} = \frac{-280}{16}$$

$$\frac{-70}{4} = \frac{-35}{2}$$

$$h'(1) = -17\tfrac{1}{2}$$

7. Graph the derivative of the function below on the grid to the right.

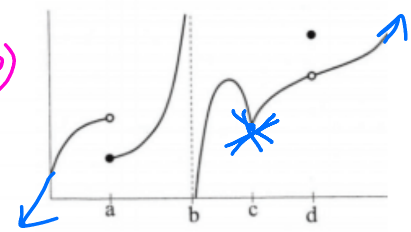




4. Consider the graph of f given to the right.

a) On what interval is f continuous?

$(-\infty, a) \cup (a, b) \cup (b, d) \cup (d, \infty)$



b) On what interval is f differentiable?

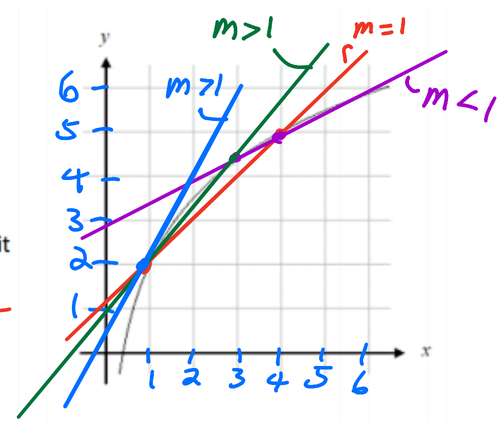
$(-\infty, a) \cup (a, b) \cup (b, c) \cup (c, d) \cup (d, \infty)$

5. Use the figure to the right to answer the following questions.

a) Find $f(1)$ and $f(4)$.

$F(1) = 2$

$F(4) = 5$



b) What is the geometric interpretation of $\frac{f(4)-f(1)}{4-1}$? Draw it on the graph to the right.

slope

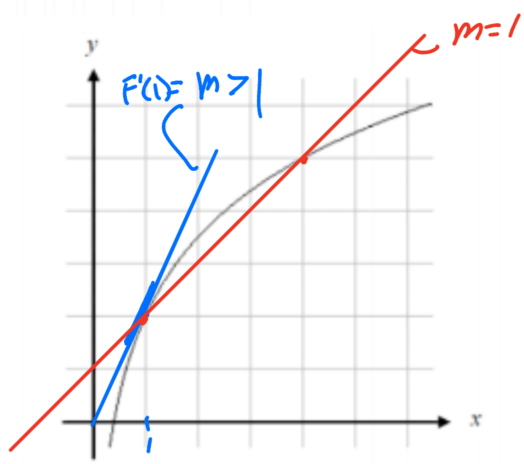
$\frac{5-2}{4-1} = \frac{3}{3} = 1$

c) Using the geometric interpretation of each expression, insert the inequality symbol (< or >) in the box between the two expressions that makes the statement true.

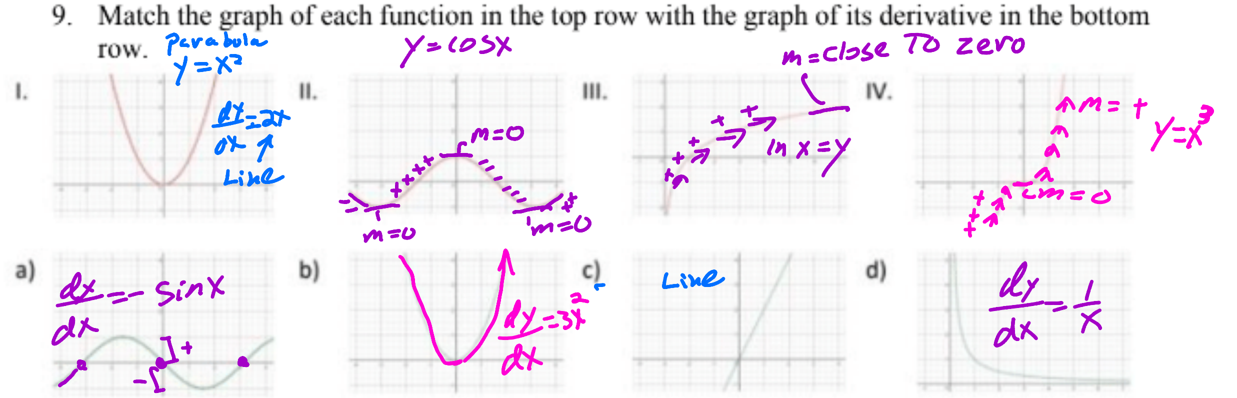
$\frac{f(4)-f(1)}{4-1} \boxed{>} \frac{f(4)-f(3)}{4-3}$ $\qquad$ $\frac{f(4)-f(1)}{4-1} \boxed{<} f'(1)$

$m=1$ $\qquad$ $m<1$

$\frac{F(3)-F(1)}{3-1}$

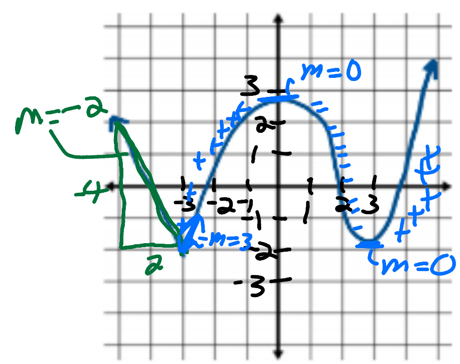


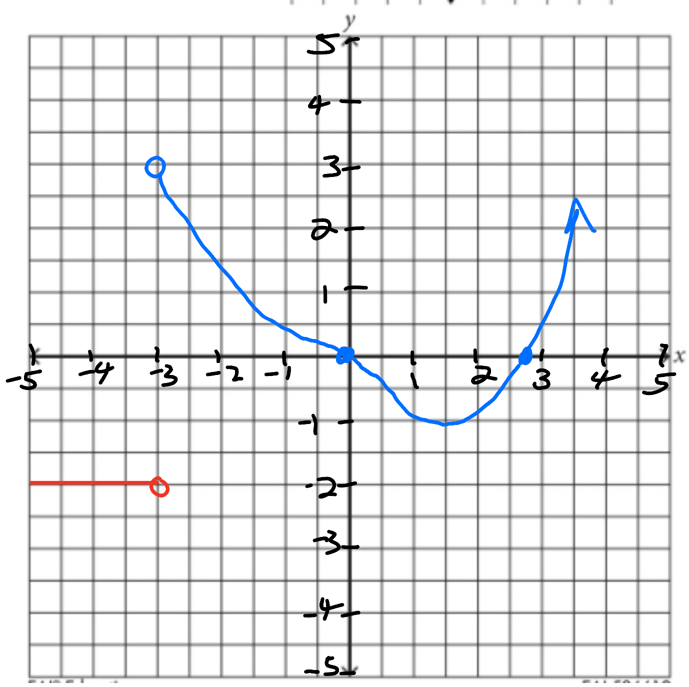
9. Match the graph of each function in the top row with the graph of its derivative in the bottom row.



I. c II. a III. d IV. b

10. Sketch the derivative of the following function.





$y = 3x^2 \sin x$

$$\frac{dy}{dx} = 6x \cdot \sin x + 3x^2 \cdot (\cos x)$$

$$y = 3\pi \cos x \Rightarrow \frac{dy}{dx} = \cancel{0 \cdot \cos x} + 3\pi(-\sin x)$$

How

$$\frac{dy}{dx} = -3\pi \sin x$$

$$y = 5\pi x^3 \Rightarrow \frac{dy}{dx} = 15\pi x^2$$

Find an equation of the tangent line to the graph of $f(x) = \dfrac{3 - (1/x)}{x + 5}$ at $(-1, 1)$.

$$F(x) = \frac{3 - x^{-1}}{x+5} \Rightarrow F'(x) = \frac{(0 - (-1)x^{-1-1})(x+5) - (3 - x^{-1})(1)}{(x+5)^2}$$

$$F'(x) = \frac{\frac{1}{x^2}(x+5) - (3 - \frac{1}{x})}{(x+5)^2}$$

$$F'(-1) = \frac{\frac{1}{(-1)^2}(-1+5) - (3 + \frac{1}{+1})}{(-1+5)^2} = \frac{1 \cdot 4 - 4}{4^2} = \frac{0}{16} = 0$$

Slope = m = 0

Point (−1, 1)

$y = mx + b$

$1 = 0(-1) + b$

$1 = b$

$y = 0x + 1 \Rightarrow y = 1$