

F(name) = Key

AP Calculus AB: 4.5 Increasing & Decreasing Functions

1. Find where the function  $g(x) = \frac{x^4}{2} - \frac{5x^3}{3} - 6x^2$  is increasing. Justify.

$$g'(x) = 2x^3 - 5x^2 - 12x$$

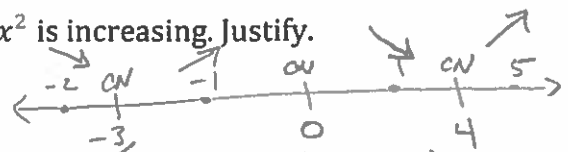
$$= x(2x^2 - 5x - 12)$$

$$0 = x(2x + 3)(x - 4)$$

$x=0$   
CN

$x = -\frac{3}{2}$   
CN

$x=4$   
CN



$$f'(-2) = -2(2(-2)+3)(-2-4) = -$$

$$f'(-1) = (-)(+)(-) = +$$

$$f'(1) = (+)(+)(-) = -$$

$$f'(5) = (+)(+)(+) = +$$

inc:  $[-\frac{3}{2}, 0]$   
 $[4, \infty)$

2. Find the interval(s) where the function is increasing on the graph  $f(x) = (x^2 - 3)e^{-x}$  and Justify.

$$f'(x) = (x^2 - 3)(-e^{-x}) + (e^{-x})(2x)$$

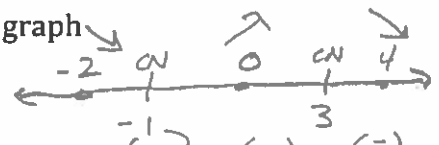
$$= -e^{-x}(x^2 - 2x - 3)$$

$$= -e^{-x}(x - 3)(x + 1)$$

$$-e^{-x} = 0$$

$x=3$   
CN

$x=-1$   
CN



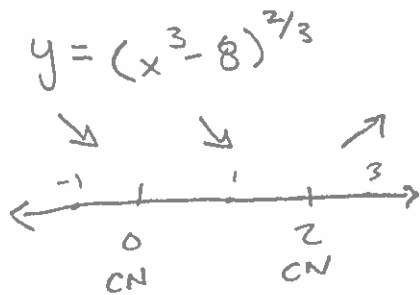
$$f'(-2) = -e^{-(-2)}((-2)^2 - 2(-2) - 3) = -$$

$$f'(0) = (-)(-)(+) = +$$

$$f'(4) = (-)(+)(+) = -$$

inc:  $[-1, 3]$

3. Find the intervals where the function is increasing and decreasing if the function is denoted by  $y = \sqrt[3]{(x^3 - 8)^2}$  and Justify



$$f'(-1) = \frac{+}{-} = -$$

$$f'(1) = \frac{+}{-} = -$$

$$f'(3) = \frac{+}{+} = +$$

inc:  $[2, \infty)$   
 dec:  $(-\infty, 2]$

4. Find the interval(s) where the function  $h'(x) = 2x^2 - 5x - 12$  is decreasing. Justify.

$$2x^2 - 5x - 12 = 0$$

dec:  $[-\frac{3}{2}, 4]$