

Analytical representation of your name: Key

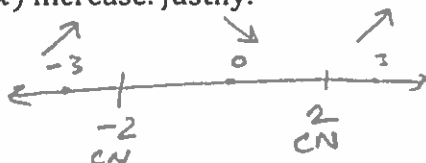
AP Calculus AB: 4.7 First Derivative Test Analytically

1. For the function $f(x) = 2x^3 - 24x$, find
a) on what interval does $f(x)$ increase. Justify.

$$f'(x) = 6x^2 - 24$$

$$0 = 6x^2 - 24$$

$$x = \pm 2$$



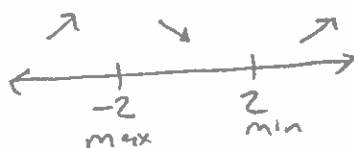
$$f'(-3) = +$$

$$f'(0) = -$$

$$f'(3) = +$$

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

b) the point(s) where $f(x)$ has max or min values. Justify.



max @ $x = -2$

min @ $x = 2$

point $(-2, 32)$
point $(2, -32)$

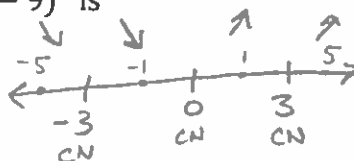
3. Find where the function $h(x) = (x^2 - 9)^3$ is
a) increasing. Justify.

$$h'(x) = 3(x^2 - 9)^2 \cdot 2x$$

$$0 = 6x(x^2 - 9)^2$$

$$6x = 0 \quad (x^2 - 9)^2 = 0$$

$$x = 0 \quad x = \pm 3$$



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

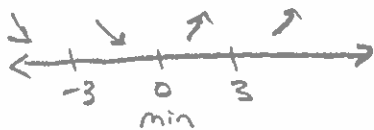
$$f'(-1) = (-)(+) = -$$

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

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

inc: $[0, \infty)$

b) has a maximum or minimum value. Justify.



min @ $x = 0$

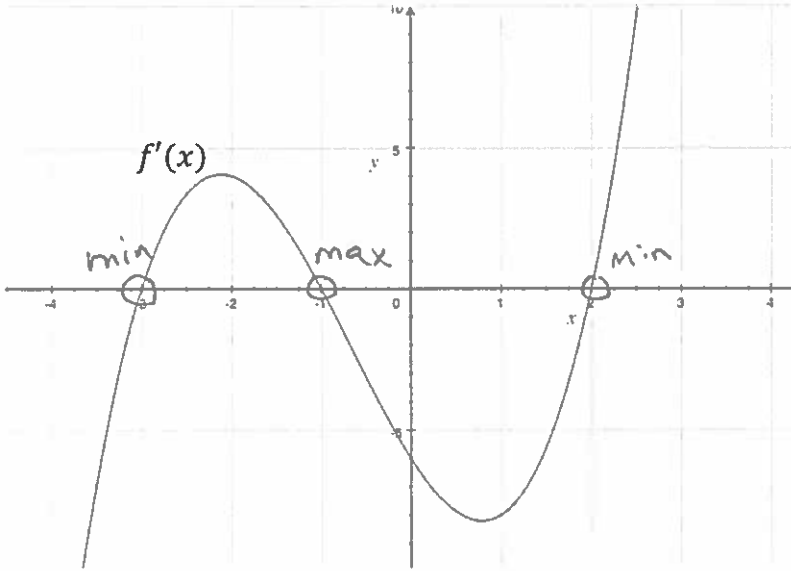
3. For the function $g(x) = \frac{e^{-x}}{x^2}$, determine where a minimum value occurs for the function $g(x)$. Justify.

$$g'(x) = \frac{-x e^{-x} (x+2)}{x^4}$$

min @ $x = -2$

Analytical representation of your name: _____

4. The graph below is a graph of the derivative of the function $f(x)$.



a) what interval is the function $f(x)$ increasing? Justify.

$[-3, -1] [2, \infty)$ b/c $f'(x)$ is positive

b) what interval is the function $f(x)$ decreasing? Justify.

$(-\infty, -3] [-1, 2]$ b/c $f'(x)$ is negative

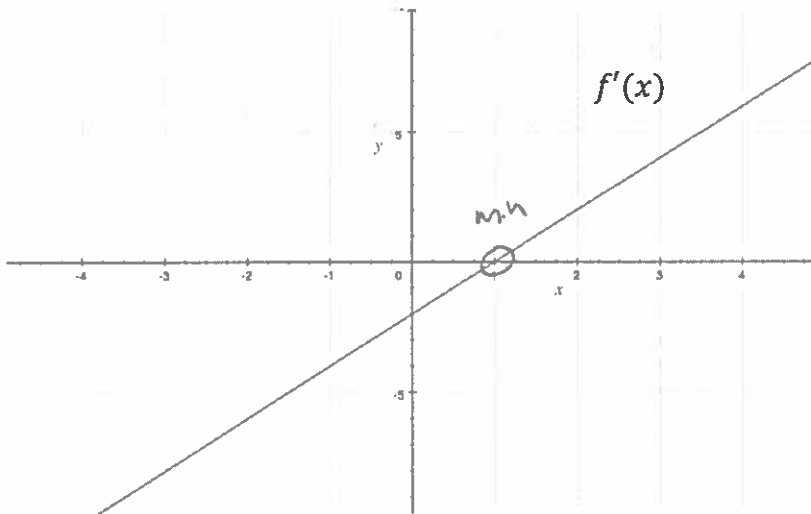
c) where does the function $f(x)$ has a maximum value? Justify.

max @ $x = -1$ b/c $f'(x)$ switched from positive to negative

d) where does the function $f(x)$ has a minimum value? Justify.

min @ $x = -3, 2$ b/c $f'(x)$ switched from negative to positive.

5.



a) what interval is the function $f(x)$ increasing? Justify.

$[1, \infty)$ b/c $f'(x)$ is positive

b) what interval is the function $f(x)$ decreasing? Justify.

$(-\infty, 1]$ b/c $f'(x)$ is negative

c) where does the function $f(x)$ has a maximum value? Justify.

None

d) where does the function $f(x)$ has a minimum value? Justify.

min @ $x = 1$ b/c $f'(x)$ switches from negative to positive.

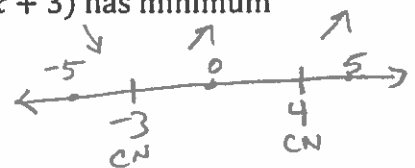
6. Find all the x-values where the function $g'(x) = (x - 4)^2(x + 3)$ has minimum values. Justify.

$$(x - 4)^2 = 0$$

$$x = 4$$

$$x + 3 = 0$$

$$x = -3$$



min @ $x = -3$

$$g'(-5) = (+)(-) = -$$

$$g'(0) = (+)(+) = +$$

$$g'(5) = (+)(+) = +$$