1. If f(x) = $\frac{x^2-6x}{x+2}$, does Rolle's theorem apply to the function on the interval [0,6]. If yes, find the value of c defined by Rolle's theorem.

2. Determine whether the Mean Value Theorem can be applied to $f(x)=\frac{x+1}{x}$ on $\left[\frac{1}{2},\ 2\right]$.

   If so, then find all values of c on (a, b) defined by MVT.

3. Use the Second Derivative Test to classify the critical points of $y=\frac{1}{4}x^4-2x^3+6$.

4. Sketch a labeled graph with the following characteristics:
   a) $f(-1) = 4$ and $f(2) = -1$
   b) $f'(x) > 0$ if $x < -1$ and if $x > 2$
   c) $f'(x) < 0$ if $-1 < x < 2$
   d) POI at point (1, 2)
   e) $f''(x) < 0$ if $x < 1$
   f) $f''(x) > 0$ if $x > 1$

5. Find the absolute maximum and absolute minimum of the function f on the given interval:

$$f(x) = \frac{x^2 - 4}{x^2 + 4} \quad \text{on } [-4,4]$$

1. If $f(x) = \frac{x^2-6x}{x+2}$, does Rolle's theorem apply to the function on the interval [0,6]. If yes, find the value of c defined by Rolle's theorem. $f(x)$ continuous, differentiable on interval $[0,6]$

$$f'(x) = \frac{(2x-6)(x+2)-(x^2-6x)(1)}{(x+2)^2}$$

$$= \frac{2x^2-2x-12-x^2+6x}{(x+2)^2}$$

$$= \frac{x^2+4x-12}{(x+2)^2}$$

$$= \frac{(x+6)(x-2)}{(x+2)^2}$$

$f(0)=0$ $f(0)=f(6)$, Rolle's applies

$f(6)=0$

set $f'(x)=0$

$$\frac{(x+6)(x-2)}{(x+2)^2} = 0$$

$x=2,-6$ $\boxed{c=2}$

2. Determine whether the Mean Value Theorem can be applied to $f(x) = \frac{x+1}{x}$ on $\left[\frac{1}{2}, 2\right]$.
If so, then find all values of c on (a, b) defined by MVT. $x \neq 0$, $f(x)$ is continuous, differentiable on interval $[\frac{1}{2}, 2]$.

$$f'(x) = \frac{(1)(x)-(x+1)(1)}{x^2}$$

$$f'(x) = \frac{-1}{x^2}$$

Find endpoints

$f(\frac{1}{2}) = 3$

$f(2) = \frac{3}{2}$

$$m_{Avg} = \frac{3-\frac{3}{2}}{\frac{1}{2}-2} = \frac{\frac{3}{2}}{-\frac{3}{2}} = -1$$

set $f'(x) = m_{Avg}$

$$\frac{-1}{x^2} = -1$$

$x^2 = 1$

$x = \pm 1$

$\boxed{c=1}$

3. Use the Second Derivative Test to classify the critical points of $y = \frac{1}{4}x^4 - 2x^3 + 6$.

$y'(x) = \frac{1}{4}\cdot 4x^3 - 6x^2 = x^3-6x^2 = x^2(x-6)$ $\boxed{x=0,6}$

$y''(x) = 3x^2-12x$

$y''(0) = 0-0$ inconclusive test at $x=0$

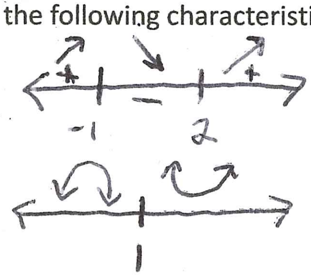
$y''(6) = 3(6)^2-12(6) = 36 > 0$, concave up

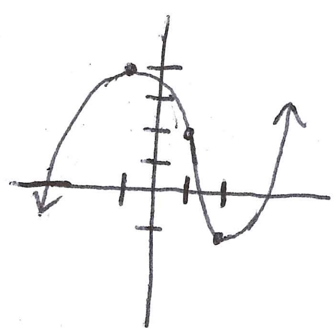
$108-72 = 36$

$\boxed{\text{Relative min at } x=6}$

4. Sketch a labeled graph with the following characteristics:

a) f(-1) = 4 and f(2) = -1
b) f'(x) > 0 if x < -1 and if x > 2
c) f'(x) < 0 if -1 < x < 2
d) POI at point (1, 2)
e) f''(x) < 0 if x < 1
f) f''(x) > 0 if x > 1





5) Find the absolute max and absolute min of function f on the given interval: $f(x) = \frac{x^2-4}{x^2+4}$; $[-4, 4]$

$$f'(x) = \frac{(2x)(x^2+4) - (x^2-4)(2x)}{(x^2+4)^2} = \frac{2x^3+8x-2x^3+8x}{(x^2+4)^2} = \frac{16x}{(x^2+4)^2}$$

* $f(x)$ is continuous on $[-4, 4]$

find critical pts: $\frac{16x}{(x^2+4)^2}$ $\quad 16x = 0 \to \boxed{x=0}$

$(x^2+4)^2 \neq 0 \to$ no critical pts

$$f(-4) = \frac{(-4)^2-4}{4^2+4} = \frac{12}{20} = \frac{3}{5}$$

$$f(4) = \frac{(4)^2-4}{4^2+4} = \frac{12}{20} = \frac{3}{5}$$

$$f(0) = \frac{0-4}{0+4} = \frac{-4}{4} = -1$$

Abs max is $\frac{3}{5}$ at $x=-4$, $x=4$

Abs. min is -1 at $x=0$