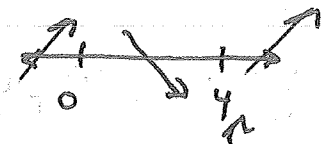
1. $f(x) = x^3 - 6x^2 + 8$

a) Find all relative extrema of f(x), as ordered pair(s). Show work.

$f'(x) = 3x^2 - 12x = 3x(x-4)$

$f'(x) = 0 \Rightarrow x = 0, 4$



The Ordered Pair (x,y)	What type of extremum is it?	How can you tell that it is that type of extremum?
(0, 8)	max	Sign chart
(4, -24)	min	

b) State intervals of concavity of f(x).

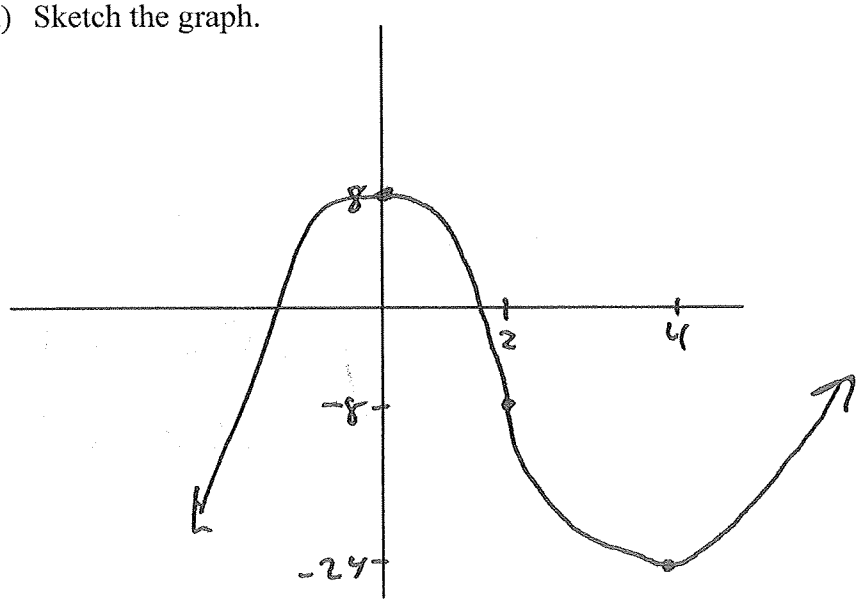
$f''(x) = 6x - 12 = 6(x-2)$, $0 = f''(x) \Rightarrow x = 2$

The Interval	Concave up or down?	How can you tell that it is concave up/down?
$(-\infty, 2)$	down	chart.
$(2, \infty)$	up	

c) Find inflection point(s) of f(x), as ordered pair(s).

(2, -8)

d) Sketch the graph.



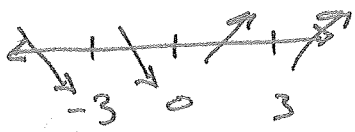
I DO
on board

MATH 125
J. Moseley

Find the open intervals on which the graph is increasing and decreasing for the following function.

$f(x)=\dfrac{x^2+7}{9-x^2}$

$$f'(x)=\frac{2x(9-x^2)-(-2x)(9-x^2)}{(9-x^2)^2}=\frac{36x}{(9-x^2)^2}$$



$(-\infty, 0)$ dec

$(0, \infty)$ inc

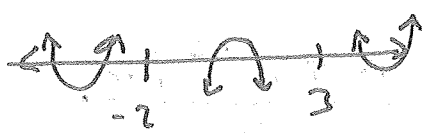
Find all points of inflection of the given function.

$f(x)=x^4-2x^3-36x^2+48x-7$

$f'(x)=4x^3-6x^2-72x+48$

$f''(x)=12x^2-12x-72=12(x^2-x-6)=12(x-3)(x+2)$

$\Rightarrow$ possible inflection pts are $x=3,-2$



$-2, 3$ inflection pts

Find the slope of the tangent line to the exponential function $y=e^{7x}$ at the point (0, 1).

$y'=7e^{7x}$

$y'(0)=7e^{7x}=7e^{7\cdot 0}=7$

$y-1=7(x-0)$

Find the derivative of the function $y=xe^x+\dfrac{e^x+e^{-x}}{2}$

$$y'=xe^x+e^x+\frac{e^x-e^{-x}}{2}$$

$f'(x) = 3x^2 + 6x - 9$

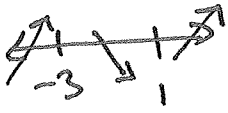
2. Given the function $f(x) = x^3 + 3x^2 - 9x + 6$, $f''(x) = 6x + 6 = 6(x+1)$

a) Find the intervals on which f is concave up or concave down.

$0 = f''(x) \Rightarrow x = -1$

b) Find all relative extrema of f. (State as ordered pairs.)

$0 = f'(x) \Rightarrow x = 1, -3$ max: $(-3, 33)$



min: $(1, 1)$

c) Find all inflection points of f. (State as ordered pairs.)

$(-1, 17)$

d) Sketch the graph of f, showing all extrema. Label at least one value on each axis so I can tell what scale you are using.