Knowledge	Thinking	Application	Communication
/10	/9	/10	/10

Total /39

Name:

Date:

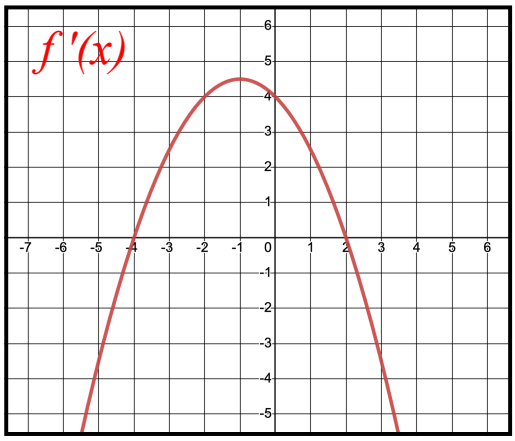
MCV4U Test

Unit 2 – Optimization

1) Given the graph of $f'(x)$, state the intervals of increase/decrease for $f(x)$. Then sketch a possible graph of $f(x)$. [3]

Decreasing:

Increasing:



2) Find all points of inflection and state the intervals of concavity for $f(x) = x^4 - 3x^3 + x - 1$. [4]

Point(s) of Inflection:

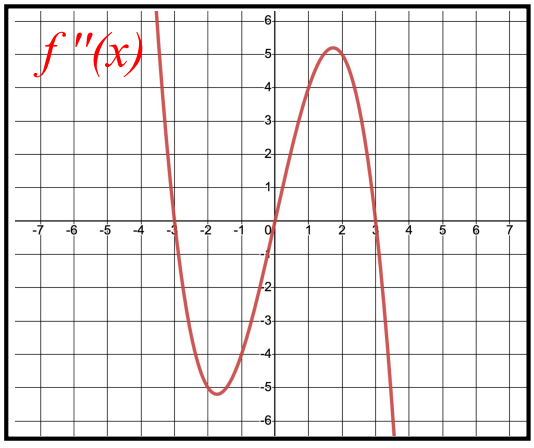
Concave Up interval:

Concave Down interval:

3) Given the graph of $f''(x)$, state the intervals of concavity for $f(x)$ [2]

Concave Up interval:

Concave Down interval:



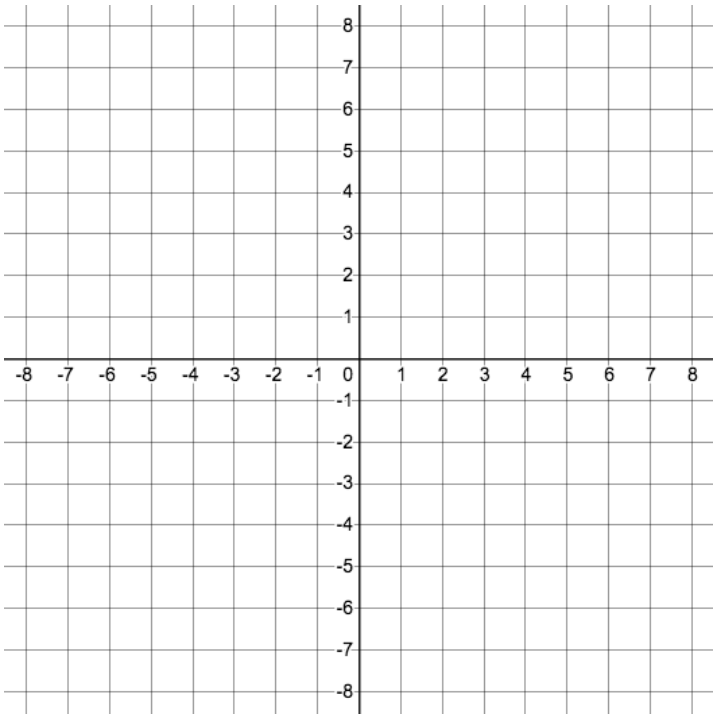
4) Determine the absolute extreme values of $f(x) = x^3 - 12x + 2$ on the interval $-5 \leq x \leq 3$. [3]

Absolute min:

Absolute max:

5) Sketch a graph of a possible function $f(x)$ that meets the following set of conditions: [1]

$f'(-4) = f'(2) = 0$, $f'(x) < 0$ when $x > 2$, $f'(x) > 0$ when $x < -4$ and $-4 < x < 2$,
$f''(x) < 0$ when $x < -4$ and $x > -1$, $f''(x) > 0$ when $-4 < x < -1$

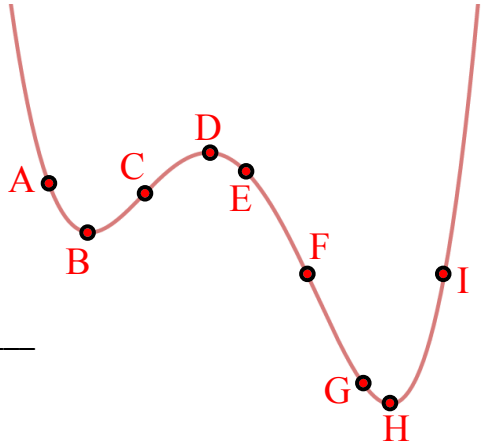


6) State the equation of any asymptotes for the following functions: [4]

a) $f(x) = \frac{3x+7}{x^2-8x-20}$

b) $g(x) = \frac{4x^2+1}{-2x^2+4x}$

7) Using the provided graph, list all letters that apply to each question. [5]



a) Where is $f'(x) = 0$ _____

b) Where is $f''(x) = 0$ _____

c) Where is $f'(x) > 0$_____

d) Where is $f''(x) < 0$ _____

e) Where is $f'(x) < 0$ and $f''(x) < 0$ _____

8) For the function $f(x) = \frac{1}{3}x^3 - \frac{3}{2}x^2 + 2x + 1$, determine the critical points and classify them using the second derivative test. [3]

9) Use the algorithm for curve sketching to sketch a graph of $f(x) = 3x^4 - 8x^3 - 6x^2 + 24x - 9$ [10]

1) State any asymptotes or holes in the graph.

2) Determine the y intercept of the graph. You are given the x-intercepts.

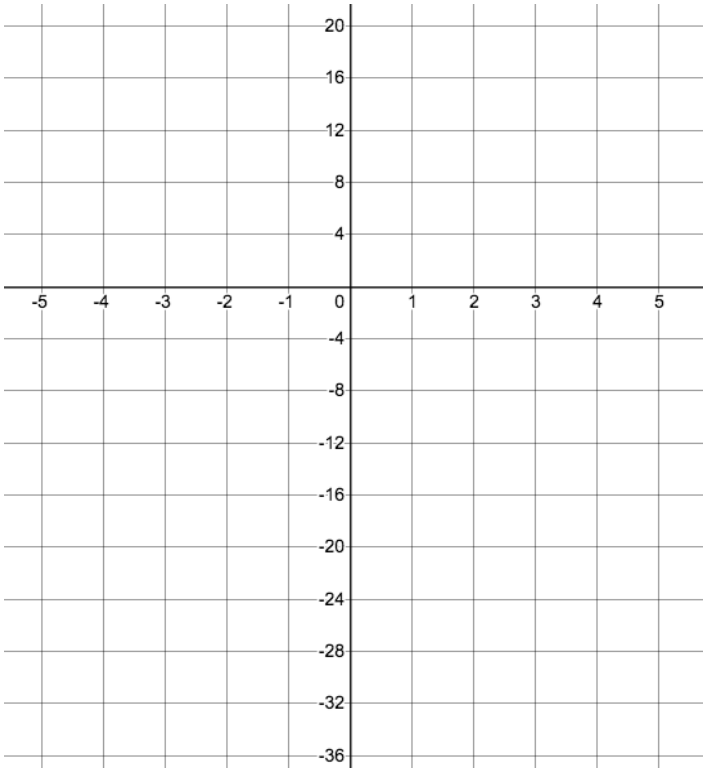
x-intercepts: y-intercept:

$(0.45,0)$
$(2.22,0)$
$(1.73,0)$
$(-1.73,0)$

3) Determine the critical POINTS

4) Determine possible points of inflection

5/6/7) Sign chart that uses critical #'s, POI's, and VA's to analyze intervals of increase/decrease and intervals of concavity. Clearly identify local extrema and POI's.



Answer 10 or 11 not both **[4]**

10) A closed box with a square base is to be made to have a volume of $10125\ \text{cm}^3$. The material for the top and bottom of the box costs three times as much as the material used for the sides of the box. Determine the dimensions that will minimize the cost of the box.

11) A train leaves the station at 8:00 a.m. and travels due south at a speed of 60 km/h. Another train has been heading due west at 40 km/h and reaches the same station at 11:00 a.m. At what time were the two trains closest together?