Calculus 1 Name Key

Review 5 Graphing and Applying Derivatives Block ____________ Date ____________

1. Find the requested information, then sketch the graph using the information found.

$f(x) = x^3 - x^2 - x + 3$

$f'(x) = 3x^2 - 2x - 1$ $f''(x) = 6x - 2$

C. V. $x = -\frac{1}{3}, x = 1$ C. V. $x = \frac{1}{3}$

Inc. $\left(-\infty, -\frac{1}{3}\right) \cup (1, \infty)$ C. U. $\left(\frac{1}{3}, \infty\right)$

Dec. $\left(-\frac{1}{3}, 1\right)$ C. D. $\left(-\infty, \frac{1}{3}\right)$

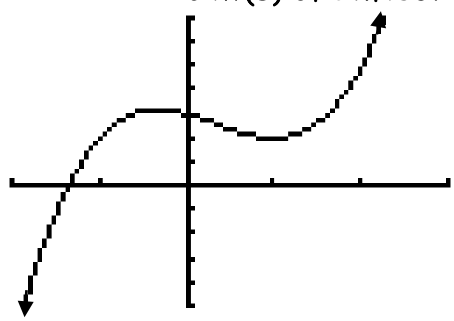
Extrema Value(s): Rel Max $\left(-\frac{1}{3}, 3.185\right)$ Point(s) of Inflection: $\left(\frac{1}{3}, 2.593\right)$

Rel Min $(1,2)$

$3x^2 - 2x - 1 = 0$

$(3x + 1)(x - 1) = 0$

$x = -\frac{1}{3}, x = 1$



2. Using the following criteria, sketch the graph of the function.

$f(-12) = -5,\quad f(-11) = -3,\quad f(-8) = 1,\quad f(-5) = -5,\quad f(-2) = -9\quad f(4) = 5\quad f(2) = \text{undefined}$

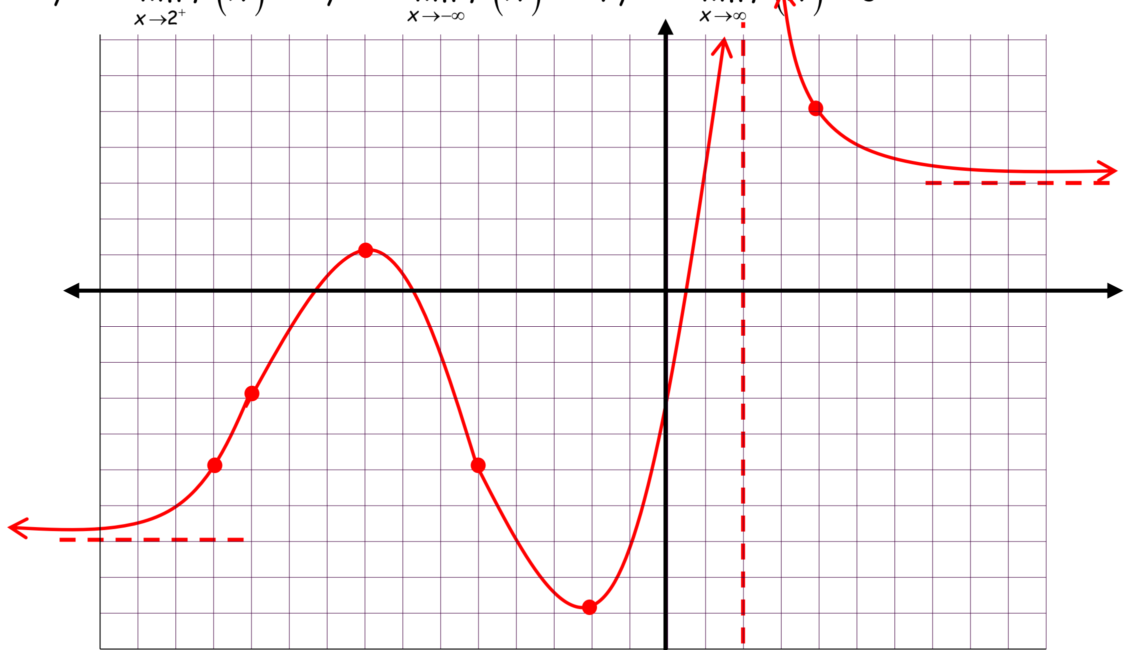
$f'(-8) = f'(-2) = 0$

$f'(x) > 0$ for $(-\infty, -8) \cup (-2, 2)$ $f'(x) < 0$ for $(-8, -2) \cup (2, \infty)$

$f''(-11) = f''(-5) = 0$

$f''(x) > 0$ for $(-\infty, -11) \cup (-5, 2) \cup (2, \infty)$ $f''(x) < 0$ for $(-11, -5)$

$\lim_{x \to 2^-} f(x) = \infty,\quad \lim_{x \to 2^+} f(x) = \infty,\quad \lim_{x \to -\infty} f(x) = -7,\quad \lim_{x \to \infty} f(x) = 3$



State the extreme values and their classifications and state the points of inflection:

Relative Max (-8,1) Rel & Abs Min (-2,-9) Pts of Inflection (-11,-3) and (-5,-5)

3-5. Does the Mean Value Theorem apply to the given function and interval? If not, state why. If it does work calculate the value of x at which it occurs.

3. $f\left(x\right)=x^3-2x^2-3x+5 \qquad \left[1,3\right]$

$f(1)=1$

$f(3)=5$

$m=\dfrac{5-1}{3-1}=\dfrac{4}{2}=2$

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

$2=3x^2-4x-3$

$x=2.12$

4. $f\left(x\right)=\dfrac{1}{3}x^3-3x \qquad \left[-2.5,3.5\right]$

$f(-2.5)=2.292$

$f(3.5)=3.792$

$m=\dfrac{3.792-2.292}{3.5-2.5}=\dfrac{1.5}{6}=.25$

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

$.25=x^2-3$

$x=\pm 1.803$

5. $f\left(x\right)=x^4+3x^3-x^2+5 \qquad \left[-3,1\right]$

$f(-3)=-4$

$f(1)=8$

$m=\dfrac{8--4}{1--3}=\dfrac{12}{4}=3$

$f'(x)=4x^3+9x^2-2x$

$3=4x^3+9x^2-2x$

$x=-2.326,-.531,.607$

6-8. Using the Min/Max Existence Theorem, determine the maximum and minimum values.

6. $f\left(x\right)=-x^2-5x+7 \qquad \left[-4,-1\right]$

$f(-4)=11$

$f(-1)=11$

$f'(x)=-2x-5$

$0=-2x-5$

$x=-2.5$

$f(-2.5)=13.25$

Abs Max (-2.5, 13.25)

Abs Min (-1,11) and (-4,11)

7. $f\left(x\right)=x^3-x^2-2x \qquad \left[-1,2.5\right]$

$f(-1)=0$

$f(2.5)=4.375$

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

$0=3x^2-2x-2$

$x=-.549$

$x=1.215$

$f(-.549)=.631$

$f(1.215)=-2.113$

Abs Max (2.5,4.375)

Abs Min (1.215,-2.113)

8. $f\left(x\right)=x^2-2x-5 \qquad \left[2,4\right]$

$f(2)=-5$

$f(4)=3$

$f'(x)=2x-2$

$0=2x-2$

$x=1$

Abs Max (4,3)

Abs Min (2,-5)