Name: ______________________ Mark: ______________________

Mini-math Div 3/4: Monday, November 23, 2020 (10 minutes)

1. Consider the function $f(x) = 2x^3 - 9x^2 - 24x + 7$

   (a) (3 points) Find the interval(s) on which f is increasing.

   Solution: Differentiating,

   $$f'(x) = 6x^2 - 18x - 24$$

   We find the critical points. f' always exists and

   $$0 = 6x^2 - 18x - 24 = 6(x^2 - 3x - 4) = 6(x-4)(x+1)$$

   so the critical points are $x = -1, 4$.
   On each subinterval, the derivative has the following sign:

		-1		4	
$x+1$	$-$	|	$+$	|	$+$
$x-4$	$-$	|	$-$	|	$+$
$f'(x)$	$+$	|	$-$	|	$+$

   Then $f(x)$ increases on $(-\infty, -1)$ and $(4, \infty)$.

   (b) (2 points) Find and classify the local extrema of f.

   Solution: By part (a) and the First Derivative Test, $x = -1$ is a local maximum and $x = 4$ is a local minimum.

2. (3 points) Find the global maximum and minimum of $f(x) = 2x^3 + 12x^2 - 10$ on $[-2, 1]$.

   Solution: The derivative is given by

   $$f'(x) = 6x^2 + 24x = 6x(x+4)$$

   which has critical points $x = -4, 0$. Only 0 is in the domain of consideration. We compute

   $$f(-2) = 2(-2)^3 + 12(-2)^2 - 10 = 22,$$
   $$f(0) = 2(0)^3 + 12(0)^2 - 10 = -10,$$
   $$f(1) = 2(1)^3 + 12(1)^2 - 10 = 4$$

   so f has a global maximum at $x = -2$ (with value 22) and a global minimum at $x = 0$ (with value -10).