MATH 141: QUIZ 7 SECTIONS 4.1-4.3

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Name: _____ Sols Key _____

No phone or calculator. You must show all work to receive full credit. Be sure to make reasonable simplifications.

1. **(5 points)** Find the absolute maximum and minimum values of $f(x) = x(2-x)^3$ over the interval $[1, 3]$.

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

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

$$= (2-x)^2(2-4x)$$

+2 $\underline{f'(x) = 0 \text{ when } x = 2 \text{ or } x = \frac{1}{2}}$ since $\frac{1}{2}$ is outside the interval

$$f(1) = (1)(2-1)^3 = 1 \qquad f(2) = (2)(2-2)^3 = 0$$

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

Absolute max of $\underline{1}$ at $x = 1$ $\Big\} +1$
Absolute min of -3 at $x = 3$

2. **(5 points)** For the function $f(x) = \frac{1}{3}x^3 - x,$

    (a) State the intervals of increase and decrease, and

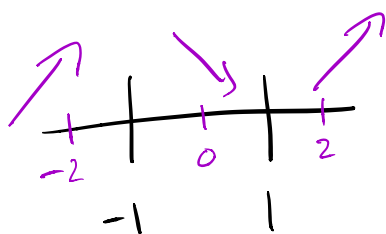   **(b)** State the local maximum and minimum points.

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

$$f'(x) = 0 \text{ when } x^2 - 1 = 0$$

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

$$x = 1, \ x = -1 \qquad +2$$

$$f'(-2) = 4 - 1 > 0$$

$$f'(0) = 0 - 1 < 0$$

$$f'(2) = 4 - 1 > 0$$

f is increasing on $(-\infty, -1) \cup (1, \infty)$
and decreasing on $(-1, 1)$ $\qquad +2$

There is a local max at $x = -1$
and a local min at $x = 1$ $\qquad +1$