

Last Name: SOLUTIONS

First Name: _____

Student ID: _____

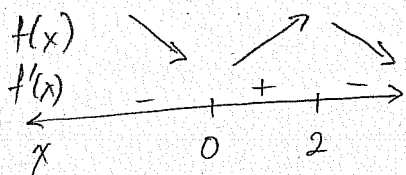
Quiz 3 (A)

Question 1. (10 marks) Use the seven step procedure to sketch the graph of $y = -x^3 + 3x^2 - 3$.

1. DOMAIN: \mathbb{R} 2. y-int: $(0, -3)$ 3. $\lim_{x \rightarrow \infty} -x^3 + 3x^2 - 3 = -\infty$ NO H.A.
 $\lim_{x \rightarrow -\infty} -x^3 + 3x^2 - 3 = \infty$

4. NO V.A.

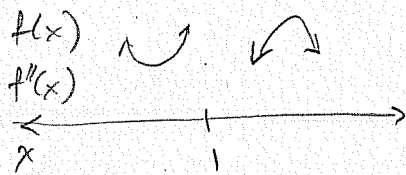
5. $f'(x) = -3x^2 + 6x = 0 \Rightarrow -3x(x - 2) = 0 \Rightarrow x = 0, 2$



TEST POINTS:
 $x = -1: f'(-1) = -9 < 0$
 $x = 1: f'(1) = 3 > 0$
 $x = 3: f'(3) = -9 < 0$

f IS INCREASING ON $(0, 2)$ AND DECREASING ON $(-\infty, 0)$ AND $(2, \infty)$
 $f(0) = -3$ IS A REL. MIN. $f(2) = -(2)^3 + 3(2)^2 - 3 = 1$ IS A REL. MAX.

6. $f''(x) = -6x + 6 = 0 \Rightarrow -6x(x - 1) = 0 \Rightarrow x = 1$



TEST POINTS:
 $x = 0: f''(0) = 6 > 0$
 $x = 2: f''(2) = -6 < 0$

$f(1) = -1 + 3 - 3 = -1$
 $f'(1) = -3 + 6 = 3$
 $\therefore (1, -1)$ IS AN INFLECTION POINT.

CONCAVE UP ON $(-\infty, 1)$
 CONCAVE DOWN ON $(1, \infty)$

