Math 234 BD6 Quiz 6 (3.1, 3.2) **Name (Last,First):** Solutions

You must show all your work to receive credit.

1a.] (3 pts) Find all the "critical numbers" of $f(x) = x^3 - 3x^2 - 24x + 7$.

$$f'(x) = 3x^2 - 6x - 24.$$

f' is never undefined.

f' is zero when $3x^2 - 6x - 24 = 0$

$$3(x^2 - 2x - 8) = 0$$

$$3(x-4)(x+2) = 0$$

$$3 = 0 \quad \text{or} \quad x - 4 = 0 \quad \text{or} \quad x + 2 = 0$$

$$\times \qquad \underline{x = 4} \qquad \underline{x = -2}$$

1b.] (2 pts) Find all the "possible inflection points" of $f(x)$.

$$f''(x) = 6x - 6.$$

f'' is never undefined.

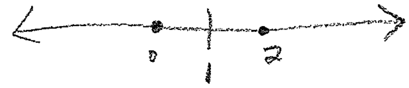
f'' is zero when $6x - 6 = 0$

$$6(x-1) = 0$$

$$6 = 0 \quad \text{or} \quad x - 1 = 0$$

$$\times \qquad \underline{x = 1}$$

1c.] (3pts) Determine all intervals on which $f(x)$ is concave up and concave down.

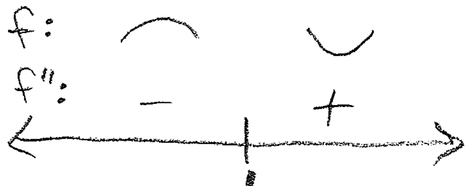


$f''(0) = 6(0) - 6 = 0 - 6 = -6 < 0$

So $f(x)$ is concave down on the interval $(-\infty, 1)$.

$f''(2) = 6(2) - 6 = 12 - 6 = 6 > 0$

So $f(x)$ is concave up on the interval $(1, \infty)$.



1d.] (2pts) Classify each critical number found in part 1a as a relative maximum, relative minimum, or neither.

Using the second derivative test:

$f''(4) = 6(4) - 6 = 24 - 6 = 18 > 0$

So $f(x)$ has a relative minimum at $x = 4$.

$f''(-2) = 6(-2) - 6 = -12 - 6 = -18 < 0$

So $f(x)$ has a relative maximum at $x = -2$.