Mr. Konichek

**Name:** Key **Quiz 5: Ch 4.1, 4.2**

***Draw a box around your final answers. No partial credit will be given.***

Find the interval(s) where the function is increasing and the interval(s) where it is decreasing.

4.1 #18 1. $f(x) = x^3 - 3x^2$

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

$3x(x-2) = 0$

$x = 0 \quad x = 2$

(−1) 0 (+1) 2 (3)

(−)(−) (+)(−) (+)(+)

$(-\infty, 0)$ increasing

$(0, 2)$ decreasing

Increasing: $(-\infty, 0) \cup (2, +\infty)$

Decreasing: $(0, 2)$

4.1 #21 2. $g(x) = x^3 + 3x^2 + 1$

$g'(x) = 3x^2 + 6x$

$3x(x+2) = 0$

$x = 0 \quad x = -2$

−2 0

(−3) (−1) (+1)

(−)(−) (−)(+) (+)(+)

Increasing: $(-\infty, -2) \cup (0, +\infty)$

Decreasing: $(-2, 0)$

4.1 #25 3. $h(x) = x^4 - 4x^3 + 10$

$h'(x) = 4x^3 - 12x^2$

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

$x = 0 \quad x = 3$

(−1) 0 (1) 3 (4)

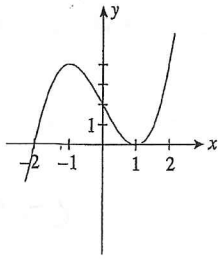
(+)(−) (+)(−) (+)(+)

Increasing: $(3, +\infty)$

Decreasing: ~~$(-\infty, 3)$~~ Textbook wrong ~~OR~~ $(-\infty, 0) \cup (0, 3)$

4.1
#3

4. Find the interval(s) where the function is increasing and the interval(s) where it is decreasing.

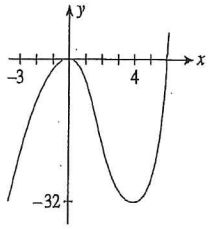



Increasing: $(-\infty, -1) \cup (+1, +\infty)$

Decreasing: $(-1, +1)$

4.1
#40

5. Determine the relative maxima and relative minima, if any.




Relative minima: $(4, -32)$

Relative maxima: $(0, 0)$

Determine where the graph of the function is concave upward or concave downward.

4.2
#34

6. $f(x) = 3x^4 - 6x^3 + x - 8$

$f'(x) = 12x^3 - 18x^2 + 1$

$f''(x) = 36x^2 - 36x$

$36x(x-1)$

$x = 0 \quad x = 1$

$\cup \quad \cap \quad \cup$

$(-1) \quad 0 \quad (1/2) \quad 1 \quad (2)$

$(-)(-) \quad (+)(-) \quad (+)(+)$

Concave upward: $(-\infty, 0) \cup (1, +\infty)$

Concave downward: $(0, 1)$

4.2
#33

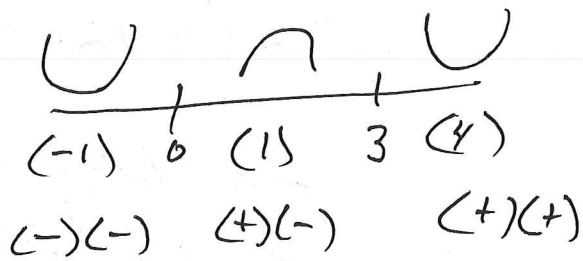
7. $f(x) = x^4 - 6x^3 + 2x + 8$

$f'(x) = 4x^3 - 18x^2 + 2$

$f''(x) = 12x^2 - 36x$

$12x(x-3) = 0$

$x = 0 \qquad x = 3$




Concave upward: $(-\infty, 0) \cup (3, +\infty)$

Concave downward: $(0, 3)$

4.2
#29

8. $f(x) = 2x^2 - 3x + 4$

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

$f''(x) = 4$

Concave upward: $(-\infty, +\infty)$

Concave downward: _____

Find the inflection point(s), if any of each function.

4.2
#52

9. $f(x) = 2x^3 - 3x^2 + 18x - 8$

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

$f''(x) = 12x - 6$

$12x - 6 = 0$

$\cancel{6x(2-1)}$

$6(2x-1) = 0$

$x = \frac{1}{2}$

$\cap \quad \cup$

$(0) \quad \frac{1}{2} \quad (1)$

$f(\frac{1}{2}) = 2(\frac{1}{8}) - 3(\frac{1}{4}) + 18(\frac{1}{2}) - 8$

$= \frac{1}{4} - \frac{3}{4} + 9 - 8$

$f(\frac{1}{2}) = \frac{1}{2}$

Inflection point(s): $(\frac{1}{2}, \frac{1}{2})$

4.2
#51

10. $f(x) = 6x^3 - 18x^2 + 12x - 20$

$f'(x) = 18x^2 - 36x + 12$

$f''(x) = 36x - 36$

$36(x-1) = 0$

$x = 1$

$\cap \quad \cup$

$(0) \quad 1 \quad (2)$

$f(1) = 6 - 18 + 12 - 20$

$f(1) = -20$

Inflection point(s): $(1, -20)$