HW 5 – 8

1. increasing: (-∞, 1)
   decreasing: (1, ∞)
   rel min: none
   rel max: (1, 3)

2. increasing: (-3, 1)
   decreasing: (-∞, -3), (1, ∞)
   rel min: (-3, -4)
   rel max: (1, 4)

6. Graph see next page
   increasing: (-1.44, 0), (.69, ∞)
   decreasing: (-∞, -1.44), (0, .69)
   rel min: (-1.44, -2.83), (.69, -.40)
   rel max: (0, 0)

7. Graph see next page
   increasing: (-1.79, 1.12)
   decreasing: (-∞, -1.79), (1.12, ∞)
   rel min: (-1.79, -8.21)
   rel max: (1.12, 4.06)

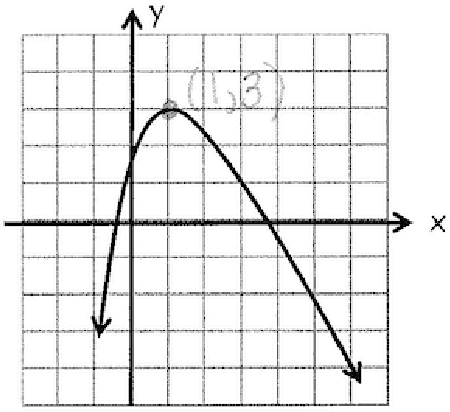
3. look left to right where you would "climb the hill", graph goes higher

4. a point on the graph higher that those on either side of it

5. determine if the leading coefficient of the polynomial is + or – and decide if the degree is odd or even

For each of the following, determine the intervals on which the graph is increasing and decreasing. Find all relative minima and maxima.

1.



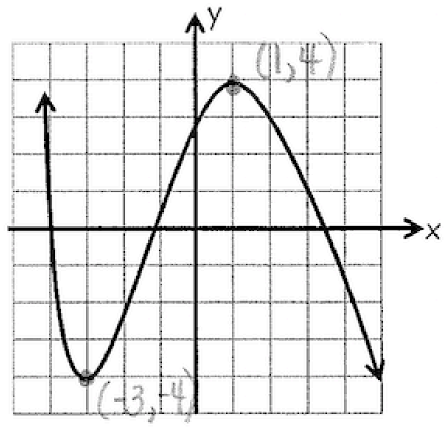
Increasing: $(-\infty, 1)$

Decreasing: $(1, \infty)$

Rel Min: none

Rel Max: $(1, 3)$

2.



Increasing: $(-3, 1)$

Decreasing: $(-\infty, -3), (1, \infty)$

Rel Min: $(-3, -4)$

Rel Max: $(1, 4)$

3. How do you determine where a graph is increasing?
look left to right where you would "climb the hill" - graph goes higher

4. In your own words, what is a relative minimum?
a place on the graph higher than those on either side of it

5. How do you determine the end behavior of the graph of a polynomial function?
Determine if the leading coefficient of the polynomial is + or − and decide if the degree is odd or even

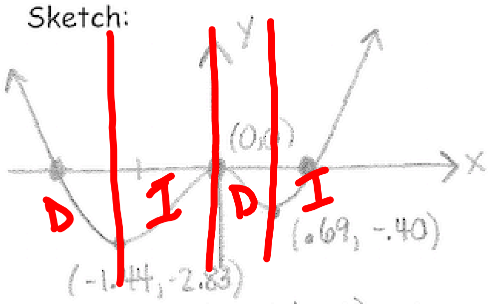
In 6 & 7, state the degree of the polynomial, find the zeros of each polynomial, state the multiplicity of each. Sketch. Using your calculator, determine relative min/max and where it's increasing/decreasing.

6. $P(x) = x^2(x + 2)(x - 1)$

Degree: 4 +

Z	M	T/C
-2	1	C
0	2	T
1	1	C

Sketch:



Increasing: (-1.44, 0), (.69, ∞)

Decreasing: (-∞, -1.44), (0, .69)

Rel Min: (-1.44, -2.83), (.69, -.40)

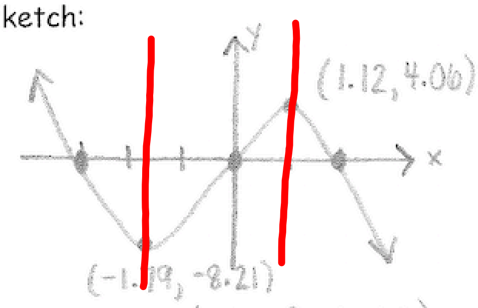
Rel Max: (0, 0)

7. $Q(x) = -x(x + 3)(x - 2)$

Degree: 3 (-)

Z	M	T/C
-3	1	C
0	1	C
2	1	C

Sketch:



Increasing: (-1.79, 1.12)

Decreasing: (-∞, -1.79), (1.12, ∞)

Rel Min: (-1.79, -8.21)

Rel Max: (1.12, 4.06)

Another use for the remainder theorem: you can determine very quickly if a given binomial is a factor of a polynomial without doing long division or factoring.

Using the remainder theorem, determine if the given binomial is a factor of the given polynomial. Remainder = 0 ? yes → then it's a factor
No → it's not a factor

1. $(x^3 - x^2 - x - 2) \div (x - 2)$

$P(2) = 2^3 - 2^2 - 2 - 2 = 0$

Remainder = 0. ∴ therefore $x-2$ is a factor of $x^3 - x^2 - x - 2$.

2. $(x^4 - 8x^3 - x^2 + 62x - 34) \div (x - 7)$

$P(7) = 7^4 - 8(7)^3 - 7^2 + 62(7) - 34 = 8$

Remainder ≠ 0 ∴ Therefore, $x-7$ is not a factor.

3. Given the polynomial $P(x) = x^3 + kx^2 + x + 6$

a. Find the value of k so that x + 1 is a factor of P.

Remainder must = 0 so $P(-1) = 0$

$$(-1)^3 + k(-1)^2 + (-1) + 6 = 0$$
$$-1 + k - 1 + 6 = 0$$
$$k + 4 = 0$$
$$k = -4$$

b. Find the other two factors of P for the value of k found in part a.

$$P(x) = x^3 - 4x^2 + x + 6 = (x+1)(x^2 - 5x + 6)$$

$$\begin{array}{r|l} & x^2 - 5x + 6 \\ x+1 & x^3 - 4x^2 + x + 6 \\ & -x^3 + {}^-x^2 \\ \hline & \quad -5x^2 + x \\ & \quad +5x^2 + 5x \\ \hline & \qquad 6x + 6 \\ & \qquad -6x + {}^-6 \\ \hline & \qquad\quad 0 \end{array}$$

$$\boxed{(x-3)(x-2)}$$

Quiz