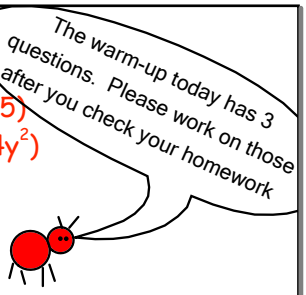
HW 5 - 6

1. $4(x-1)^2(x+1)^2$
2. $5x^2(x-5)(x^2+5x+25)$
3. $(x-2y)(x+2y)(x^2+4y^2)$
4. $(x+y+z)(x+y-z)$
5. $\{\pm 2i\sqrt{2}, \pm 2\sqrt{2}\}$
6. $\{-2, \pm 4\}$
7. $\{0, \pm 1, 2\}$
8. $\{\pm i\sqrt{2}, \pm 1\}$



Oct 29-7:58 PM

In 1 - 4, Factor Completely.

1. $4x^4 - 8x^2 + 4$

$4(x^4 - 2x^2 + 1)$

$4(x^2-1)(x^2-1)$

$4(x-1)(x+1)(x-1)(x+1)$

$4(x-1)^2(x+1)^2$

2. $5x^5 - 625x^2$

$5x^2(x^3-125)$

$5x^2(x-5)(x^2+5x+25)$

3. $x^4 - 16y^4$

$(x^2-4y^2)(x^2+4y^2)$

$(x-2y)(x+2y)(x^2+4y^2)$

Let $u = x+y$

4. $(x+y)^2 - z^2$

$u^2 - z^2$

$(x+y+z)(x+y-z)$

Oct 29-7:58 PM

In 5 - 8, write in factored form and find the zeros.

5. $f(x) = x^4 - 64$

$f(x) = (x^2+8)(x^2-8)$

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

$x^2 = -8 \quad x^2 = 8$

$x = \pm 2i\sqrt{2} \quad x = \pm 2\sqrt{2}$

$\{\pm 2i\sqrt{2}, \pm 2\sqrt{2}\}$

6. $f(x) = x^3 + 2x^2 - 16x - 32$

$f(x) = x^2(x+2) - 16(x+2)$

$f(x) = (x+2)(x^2-16)$

$f(x) = (x+2)(x-4)(x+4)$

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

$x = -2, \ x = 4, \ x = -4$

$\{-2, \pm 4\}$

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

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

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

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

$f(x) = x(x-1)(x+1)(x-2)$

$0 = x(x-1)(x+1)(x-2)$

$x = 0, \ x = 1, \ x = -1, \ x = 2$

$\{0, \pm 1, 2\}$

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

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

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

$0 = (x^2+2)(x+1)(x-1)$

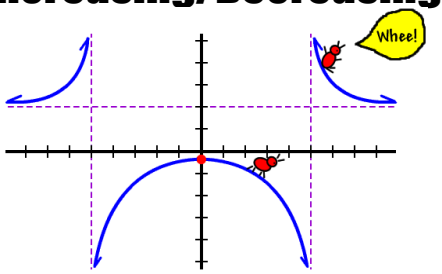
$x^2+2 = 0 \quad x+1 = 0 \quad x-1 = 0$

$x = \pm i\sqrt{2} \quad x = -1 \quad x = 1$

$\{\pm i\sqrt{2}, -1, 1\}$

Oct 29-7:55 PM

Increasing/Decreasing

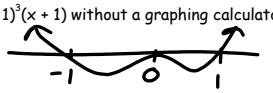


Oct 29-7:59 PM

Icebod

Explain how you would sketch $P(x) = x^2(x-1)^3(x+1)$ without a graphing calculator.

1. Even/Odd Exp.
2. Neg/Pos



3. Multiplicity Even Tangent Odd Cross
4. Zeros

Sketch a graph that has 2 real zeros and 2 imaginary zeros.

What do you think it means if a function is increasing? Decreasing?

Oct 29-8:01 PM

Interval Notation A **notation** for representing an **interval** as a pair of numbers. The numbers are the endpoints of the **interval**. Parentheses and/or brackets are used to show whether the endpoints are excluded or included. For example, [2, 7) is the **interval** of real numbers between 2 and 7, including 2 and excluding 7.

Graphically →

Increasing → a function f is increasing on an interval if, for any 2 points in the interval, a positive change in x results in a positive change for f(x).

$f(x) = y$

Decreasing → a function f is decreasing on an interval if, for any 2 points in the interval, a positive change in x results in a negative change for f(x).

* When determining increasing/decreasing we are concerned with the X - VALUES!!! Left to right

And all intervals are written in (,) form

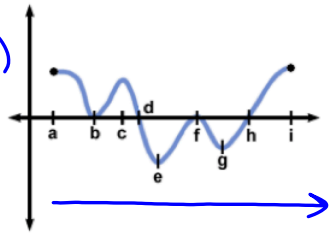
Oct 29-8:11 PM

* When determining increasing/decreasing we are concerned with the X - VALUES!!!

Where is the graph at right increasing/decreasing?

Increasing:
(b,c), (e,f), (g,i)

Decreasing?
(a,b), (c,e), (f,g)



Oct 29-8:17 PM

Relative Maximum → of a function f is a value f(c) that is > all range values of f on some interval containing c. f(c): y

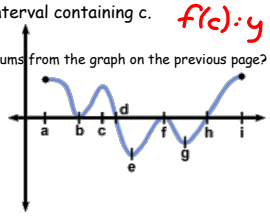
y-values

Relative Minimum → of a function f is a value f(c) that is < all range values of f on some interval containing c. f(c): y

Where are the relative minimums and maximums from the graph on the previous page? (shown again here)

Mimimums: e, g, b

Maximums: c, a, i

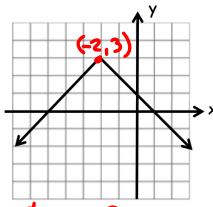


Oct 29-8:17 PM

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

* When determining increasing/decreasing we are concerned with the X - VALUES!!!

1.



Increasing: (-∞, -2)

x-value(s)

Decreasing: (-2, ∞)

Rel Min: none

y-values

Rel Max: (-2, 3)

-∞ + → -2 - → ∞

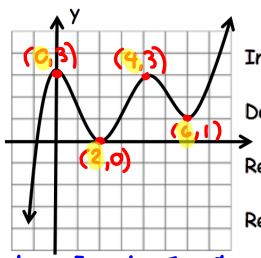
Describe the behavior of the above functions as x approaches positive and negative infinity

x → ∞ y → -∞

x → -∞ y → -∞

Oct 29-8:17 PM

2.



Increasing: (-∞, 0), (2, 4), (6, ∞)

Decreasing: (0, 2), (4, 6)

Rel Min: (2, 0), (6, 1)

Rel Max: (0, 3), (4, 3)

-∞ + → 0 - → 2 + → 4 - → 6 + → ∞

Describe the behavior of the above functions as x approaches positive and negative infinity

x → ∞ y → ∞

x → -∞ y → -∞

Oct 29-8:28 PM

Using your graphing calculator, sketch each of the following. Determine intervals where increasing, decreasing and any relative minima or maxima.

1. $y = 3x^2 - 2x + 1$

Increasing: _____

Decreasing: _____

Rel Min: _____

Rel Max: _____

Oct 29-8:29 PM

2. $y = 2x^3 + 3x^2 - 1$

Increasing: _____

Decreasing: _____

Rel Min: _____

Rel Max: _____

Oct 29-8:30 PM

HW Answers 5-6

1. $(x^n - 4)(x^n - 1)$
2. $3x(x - 1)(x^2 + x + 1)$
3. $x(2x - 5)$
4. $\{0, 1, -1, 4\}$
5. $\{ \pm i\sqrt{6}, \pm\sqrt{3} \}$
6. $\{0, 7/5, -7/5\}$

Oct 29-11:53 AM

In 1 – 3, Factor Completely; 4 – 6, write in factored form and find the roots.

1. $x^{2n} - 5x^n + 4$
2. $3x^4 - 3x$
3. $2(x - 1)^2 - (x - 1) - 3$
4. $2x^4 + 8x^3 = 2x^2 + 8x$
5. $x^4 + 3x^2 - 18 = 0$
6. $25x^3 = 49x$

Oct 29-1:07 PM