

## HW 5 - 6

## Quiz today on Factor &amp; Solve

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

$$\begin{aligned}
 &4(x^4 - 2x^2 + 1) \\
 &= 4(x^2 - 1)(x^2 - 1) \\
 &= 4(x-1)(x+1)(x-1)(x+1) \\
 &= 4(x-1)^2(x+1)^2
 \end{aligned}$$

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

$$\begin{aligned}
 &(x^2 - 4y^2)(x^2 + 4y^2) \\
 &= (x-2y)(x+2y)(x^2 + 4y^2)
 \end{aligned}$$

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

$$\begin{aligned}
 &5x^2(x^3 - 125) \\
 &= 5x^2(x-5)(x^2+5x+25)
 \end{aligned}$$

$$\text{let } u = \underline{x+y}$$

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

$$\begin{aligned}
 &\underline{(x+y+z)(x+y-z)} \\
 &u^2 - z^2 = (\underline{u+z})(\underline{u-z})
 \end{aligned}$$

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

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

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

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

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

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

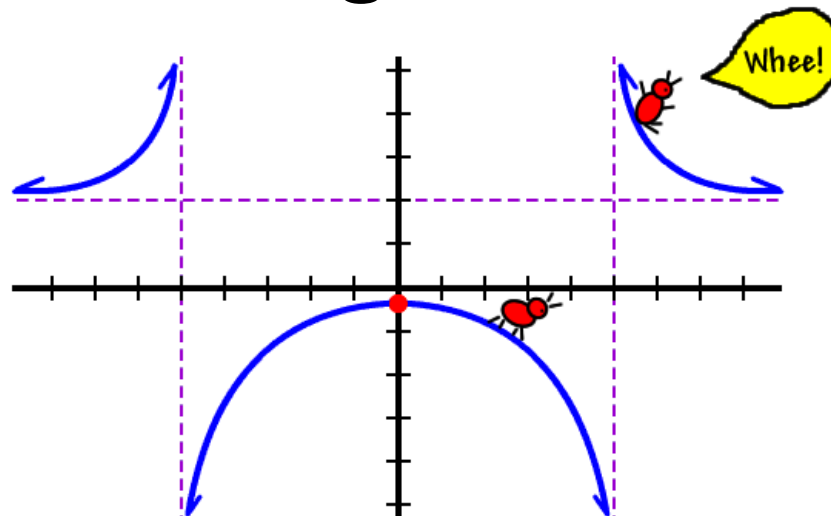
$$\{\pm i\sqrt{2}, -1, 1\}$$

Oct 29-7:55 PM

# QUIZ

Nov 14-5:23 PM

# Increasing/Decreasing



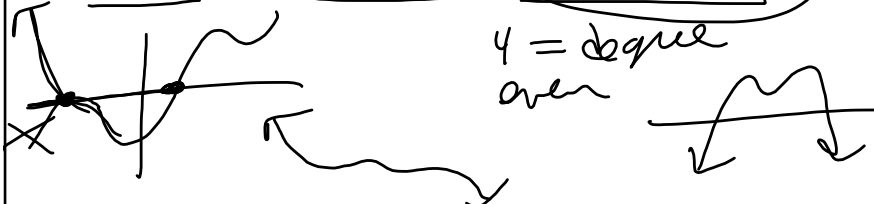
Oct 29-7:59 PM

Wants

$$x^2 \cdot x^3 \cdot x =$$

Explain how you would sketch  $P(x) = x^2(x-1)^3(x+1)$  without a graphing calculator.  
 Determine end behavior, degree is 6,  $+x^6$ .  
 Find the zeros, look at multiplicities to determine if we touch or cross at the zeros.

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



4 = degree  
over

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

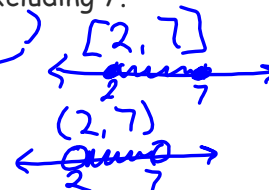
Increasing  $\rightarrow$  as we move to the right,  
graph goes up.

Decreasing  $\rightarrow$  as we move to the right,  
graph goes down

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  $f(x)$ .

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!!!

And all intervals are written in ( , ) form

(low, high)

Oct 29-8:11 PM

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

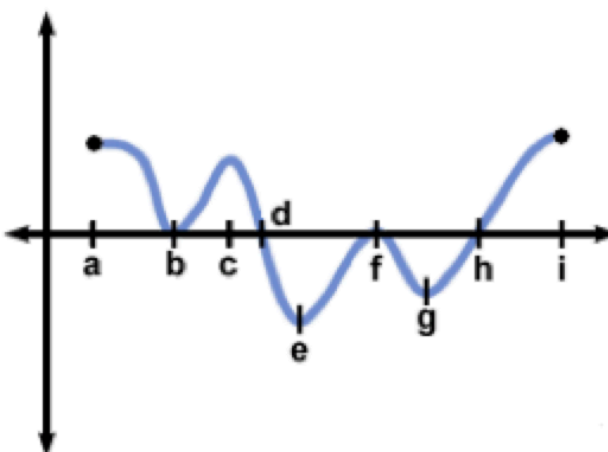
Where is the graph at right increasing/decreasing?

Increasing:

$(b, c)$   $(e, f)$   $(g, i)$

Decreasing?

$(a, b)$   $(c, e)$   $(f, g)$



Oct 29-8:17 PM

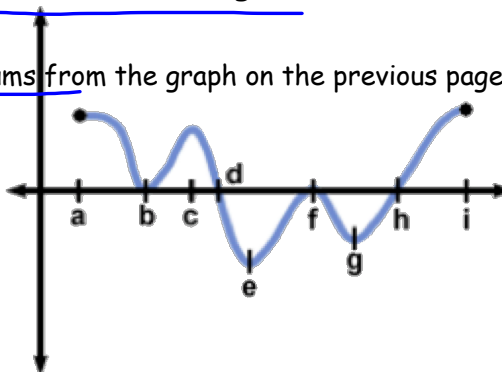
Relative Maximum  $\rightarrow$  of a function  $f$  is a value  $f(c)$  that is  $>$  all range values of  $f$  on some interval containing  $c$ .

Relative Minimum  $\rightarrow$  of a function  $f$  is a value  $f(c)$  that is  $<$  all range values of  $f$  on some interval containing  $c$ .

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

Minimums: b, e, g

Maximums: a, c, f, i



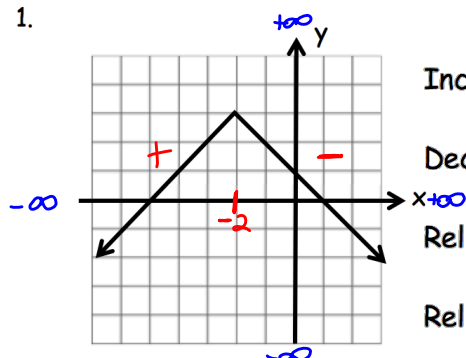
Oct 29-8:17 PM

For each of the following, determine the intervals on which the graph is increasing and decreasing.

Find all relative minima and maxima. (plural)

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

1.



Increasing:  $(-\infty, -2)$

Decreasing:  $(-2, \infty)$

Rel Min: ~~-2~~ none

Rel Max:  $(-2, 3)$

point not  
an interval

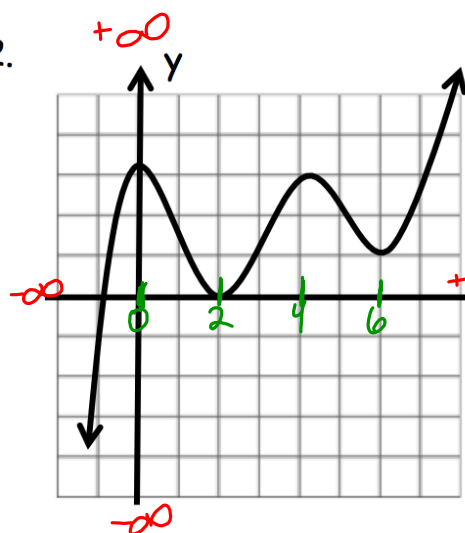
Describe the behavior of the above functions  
as  $x$  approaches positive and negative infinity

$x \rightarrow \infty$   $y \rightarrow -\infty$

$x \rightarrow -\infty$   $y \rightarrow -\infty$

Oct 29-8:17 PM

2.

Increasing:  $(-\infty, 0)$   $(2, 4)$   $(6, \infty)$ *x-intervals*Decreasing:  $(0, 2)$   $(4, 6)$ 

Rel Min:

*points*

Rel Max:

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

 $x \rightarrow \infty$  $x \rightarrow -\infty$ 

Oct 29-8:28 PM