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

The warm-up today has 3 questions. Please work on those after you check your homework

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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. $x^4 - 16y^4$

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

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

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

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

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

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

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

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

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

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

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

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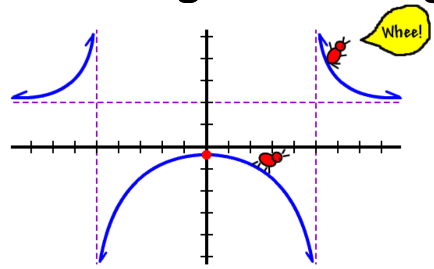
Increasing/Decreasing



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

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 <u>increasing</u> 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 <u>decreasing</u> 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

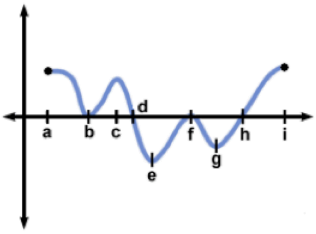
Oct 29-8:11 PM

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

Where is the graph at right increasing/decreasing?

Increasing:

Decreasing?



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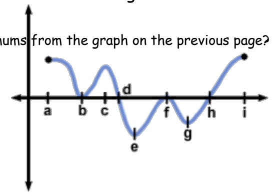
Relative Maximum ⟶ of a function f is a value f(c) that is > all range values of f on some interval containing c.

Relative Minimum ⟶ 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)

Mimimums: ____________________

Maximums: ____________________



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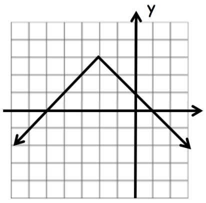
For each of the following, determine the intervals on which the graph is increasing and decreasing.
Find all relative minima and maxima.

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

1.



Increasing: ____________________

Decreasing: ____________________

Rel Min: ____________________

Rel Max: ____________________

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

$x \to \infty$ ____________________

$x \to -\infty$ ____________________

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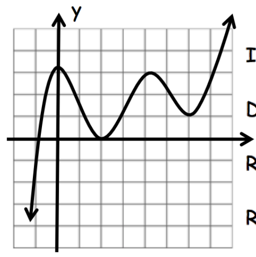
2.



Increasing: ____________________

Decreasing: ____________________

Rel Min: ____________________

Rel Max: ____________________

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

$x \to \infty$ ____________________

$x \to -\infty$ ____________________

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HW Answers 5-7

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. $\{\cancel{\pm i\sqrt{6}}\ \pm\sqrt{2}, \pm\sqrt{3}\}$
6. $\{0, 7/5, -7/5\}$

1. HW tonight 5-8
2. Quiz tomorrow on Day 3 and 4 and 7 and 8. No calculator!
3. HW tomorrow is 5-9 can start early if you want.
4. Castle Learning Unit 5 will be shared with you if you want to start over break

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

$4x^4 - 13x^2 + 3 = 0$ P: 12 S: -13 -12, -1

$4x^4 - 12x^2 - 1x^2 + 3 = 0$

$4x^2(x^2-3) - 1(x^2-3) = 0$

$(x^2-3)(4x^2-1) = 0$

$(x^2-3)(2x-1)(2x+1) = 0$

$x^2-3=0$	$2x-1=0$	$2x+1=0$
$\sqrt{x^2}=\sqrt{3}$	$x=\frac{1}{2}$	$x=-\frac{1}{2}$
$x=\pm\sqrt{3}$		

Nov 19-8:53 AM

$2u^2 - u - 3$ P: -6 S: -1 -3, 2

$2u^2 - 3u + 2u - 3$

$u(2u-3) + 1(2u-3)$

$(u+1)(2u-3)$

$(x-1+1)(2(x-1)-3)$

$x(2x-2-3)$

Nov 19-8:56 AM

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

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

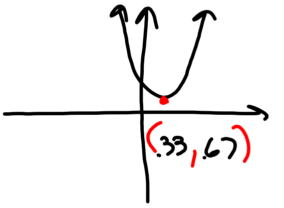
2nd trace min

Increasing: $(.33, \infty)$

Decreasing: $(-\infty, .33)$

Rel Min: $(.33, .67)$

Rel Max: none



$-\infty \xrightarrow{-} .33 \xrightarrow{+} \infty$

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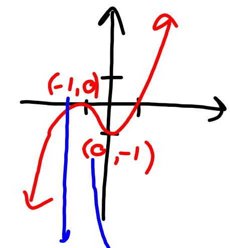
2. $y = 2x^3 + 3x^2 - 1$

Increasing: $(-\infty, -1), (0, \infty)$

Decreasing: $(-1, 0)$

Rel Min: $(0, -1)$
valley

Rel Max: $(-1, 0)$
peak



$-\infty \xrightarrow{+} -1 \xrightarrow{-} 0 \xrightarrow{+} \infty$

Oct 29-8:30 PM

Nov 19-11:10 AM