Warm up February 29 Monday

Factor completely: $f(x) = 6x^4 + 13x^3 - 45x^2 + 2x + 24$

Look at the calculator's table and find as many as integer zeros as you can.

Do synthetic division.

Factor the remaining polynomial if needed.

x	y
1	0
-4	0

$$\begin{array}{r|rrrrr} 1 & 6 & 13 & -45 & 2 & 24 \\ & \downarrow & 6 & 19 & -26 & -24 \\ \hline -4 & 6 & 19 & -26 & -24 & \boxed{0} \\ & \downarrow & -24 & 20 & 24 & \\ \hline & 6 & -5 & -6 & \boxed{0} & \end{array}$$

$6x^2$ x c

$6x^2-5x-6$

-36, -5

-9, $+4$

$\frac{-9}{6}$ $\frac{-3}{2}$ $\frac{+4}{6}$ $\frac{2}{3}$

$(2x-3)(3x+2)(x-1)(x+4)$

Feb 26-8:33 AM

Topic 1: Polynomial Operations (add, subtract, multiply, divide) & Factoring

1) Subtract $2x^4 - 8x^2 - x + 10$ from $8x^4 - 4x^3 - x + 2$

$(8x^4-4x^3-x+2)-(2x^4-8x^2-x+10)$

$= 8x^4-4x^3-x+2-2x^4+8x^2+x-10 = 6x^4-4x^3+8x^2-8$

2) Factor Completely.

$27x^3 - 125 = (3x-5)(9x^2+15x+25)$

$3x$ 5 $(a-b)(a^2+ab+b^2)$

$343x^3 + 216 = (7x+6)(49x^2-42x+36)$

$7x$ 6 $(a+b)(a^2-ab+b^2)$

Feb 26-8:26 AM

3) Find the product of $(x - 4)$ and $(4x^2 - 5x + 3)$.

$(x-4)(4x^2-5x+3)$

$4x^3-5x^2+3x-16x^2+20x-12$

$=4x^3-21x^2+23x-12$

Feb 26-8:27 AM

4) Factor completely: $f(x) = 6x^4 + 13x^3 - 45x^2 + 2x + 24$ using the table and synthetic division.

f(x) = (   )(   )(   )(   )

See today's warm up

Feb 26-8:28 AM

5) Find the solutions of the equation $3x^4 - 27x^2 + 9x = x^3$ using the table and synthetic division.

x = -3, 0, 3, $\frac{1}{3}$

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

$3x^4 - x^3 - 27x^2 + 9x = 0$

$+0$

x	y
-3	0
0	0
3	0
$\frac{1}{3}$	0

-3	3	-1	-27	9	0 ← Don't forget
	↓	-9	30	-9	0
0	3	-10	+3	0	$\boxed{0}$
	↓	0	0	0	
3	3	-10	3	$\boxed{0}$	
	↓	9	-3		
	3	-1	$\boxed{0}$		

tbl set

$\Delta \frac{1}{3}$

$3x-1=0 \quad 3x=1 \quad x=\frac{1}{3}$

Feb 26-8:28 AM

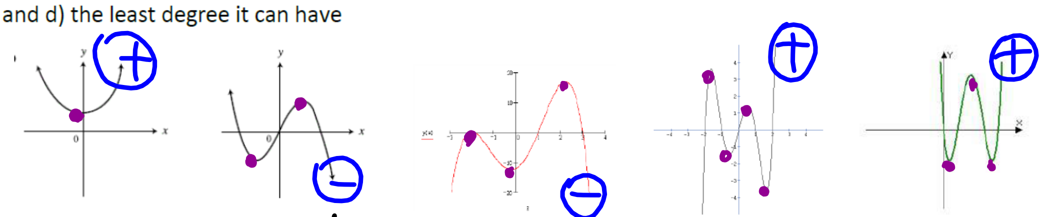
6) $(2x^3 + 6x^2 - 5x + 11) \div (x + 3) = 2x^2 - 5 + \frac{26}{x+3}$

-3	2	6	-5	11
	↓	-6	0	15
	2	0	-5	$\boxed{26}$
	x^2	x	c	

Feb 26-8:28 AM

Topic 2: Polynomial Graphs Characteristics (End Behavior, Turning Points, Degree, etc.)

1) For each graph, determine: a) even or odd DEGREE, b) a positive or negative leading coefficient, c) # of turning points, and d) the least degree it can have



even	odd	even	odd	even
+	−	−	+	+
1 turning point	2tp	3tp	4TP	3 TP
at least degree 2	at least deg 3	at least deg 4	at least deg 5	at least deg 4

Feb 26-8:28 AM

Topic 3: Data Analysis (Quadratic Regression)

1) An object is launched into the air. The table shows the height above the ground in meters of the object at different times in seconds.

a. Write a quadratic function to model the data. Round to the 100th place.

Time (seconds)	1	2	3	4	5	6
Height (meters)	68	99	120	132	134	126

L_1 L_2

y = $Y_1 = -4.84x^2 + 45.50x + 27.3$

b. Which is the best reasonable estimate of the height of the object after 9 seconds? 45 meters

from table $X = 9$ $Y = 44.76$

X	Y_1
9	44.76

c. Estimate the time it will take for the object to reach the ground. About 10 seconds.

from table $X = 10 \rightarrow y = \text{about } 0$

Stat. edit. L_1 L_2

Quadratic (because an object is launched)

Feb 26-8:29 AM

Topic 4: Properties of Rational Exponents and Radicals

1) Simplify. Assume x is positive. $-\frac{1}{6}\sqrt{4x} - \frac{1}{6}\sqrt{9x}$.

$= -\frac{1}{6} \cdot 2\sqrt{x} - \frac{1}{6} \cdot 3\sqrt{x} = -\frac{2}{6}\sqrt{x} - \frac{3}{6}\sqrt{x} = -\frac{5}{6}\sqrt{x}$

2) Simplify. Assume x is positive. $\sqrt{25x^3} + x\sqrt{16x}$

$\sqrt{25x^3} + x\sqrt{16x}$

$x^2 x$

$5x\sqrt{x} + x \cdot 4\sqrt{x} = \boxed{9x\sqrt{x}}$

Feb 26-8:29 AM

Topic 5: Radical and Rational Exponents Equations

1) $\left(\sqrt{2x+30}\right)^2 = (x+3)^2$

$2x + 30 = x^2 + 6x + 9$

$0 = x^2 + 4x - 21$

$(x+7)(x-3) = 0$

Solution: $x = 3$, -7 extraneous

2) $250x^{\frac{3}{2}} = 2$

$\left(x^{\frac{3}{2}}\right)^{\frac{2}{3}} = \left(\frac{2}{250}\right)^{\frac{2}{3}} = \left(\frac{1}{125}\right)^{\frac{2}{3}}$

$x = \left(\frac{1}{125}\right)^{\frac{2}{3}}$

calculator $= \frac{1}{25} = 0.04$

3) $\left(\sqrt[3]{10x+9}\right)^3 = \left((x+3)^{\frac{2}{3}}\right)^3$

$(x+3)(x+3)$

$10x + 9 = (x+3)^2$

$10x + 9 = x^2 + 6x + 9$

$x^2 - 4x = 0$

$x(x-4) = 0$

$x = 0$, $x - 4 = 0$

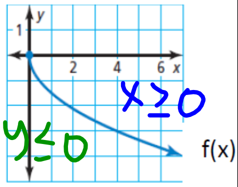
2 solutions $x = 0, 4$

no extraneous

Feb 26-8:29 AM

Topic 6: Inverses

1) What is the domain and range of the inverse of the function show in the graph?



f(x) Domain: $x \geq 0$ Range: $y \leq 0$

$f^{-1}(x)$ Domain: $x \leq 0$ Range: $y \geq 0$

2) What is the inverse of

a) $f(x) = (x + 2)^3 - 5$?

$y = (x+2)^3 - 5$

$x = (y+2)^3 - 5$
$+5 \qquad +5$

$\sqrt[3]{(y+2)^3} = \sqrt[3]{x+5}$

$y+2 = \sqrt[3]{x+5}$
$-2 \qquad -2$

$y = \sqrt[3]{x+5} - 2$

$f^{-1}(x) = \sqrt[3]{x+5} - 2$

b) $f(x) = (x + 2)^2 - 5$? $\rightarrow x \in \mathbb{R}$

$y = (x+2)^2 - 5$

$x = (y+2)^2 - 5$
$+5 \qquad +5$

$\sqrt{x+5} = \sqrt{(y+2)^2}$

$y+2 = \pm\sqrt[2]{x+5}$ $y \in \mathbb{R}$

$y = \pm\sqrt{x+5} - 2 = f^{-1}(x)$

Feb 26-8:30 AM

3) When given a table of f(x), in order to get $f^{-1}(x)$, I need to Switch x & y.

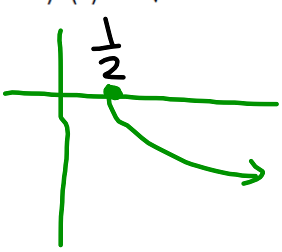
4) When given a graph of f(x), in order to get $f^{-1}(x)$, I need to reflect f(x) in the line $y = x$ or Switch x and y coordinates.

5) To determine if two functions are inverses of each other, use Compositions of functions.
Check if $f(g(x)) = x$ and if $g(f(x)) = x$

Topic 7: Square Root and Cubic Functions Graphs (Characteristics, Domain/Range, and transformation)

1) Describe the domain and range of the following functions. Sketch the graphs.

a) $f(x) = -\sqrt{2x - 1}$



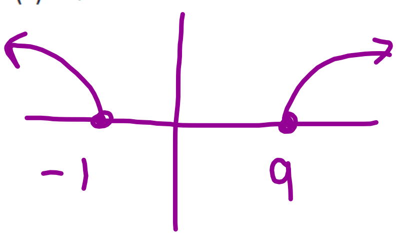
D: $2x - 1 \geq 0$

$2x \geq 1$

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

R: $y \leq 0$

b) $f(x) = \sqrt{x^2 - 8x - 9}$



D: $x \geq 9$ or $x \leq -1$

R: $y \geq 0$

Feb 26-8:31 AM

2) Let $f(x) = 3\sqrt{x+2} - 5$. Keep the opening direction and the shape. Translate the graph to 3 units to the right and 4 units down.

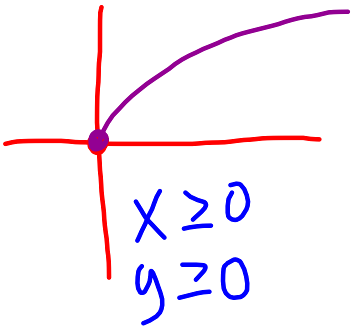
$x \to x-3$ $\quad -4$

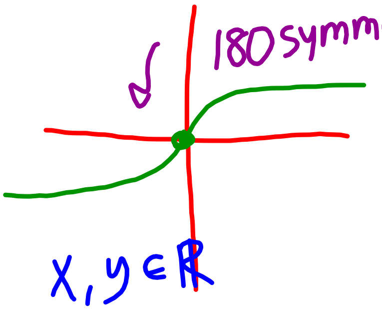
$3\sqrt{(x-3)+2} - 5 - 4$

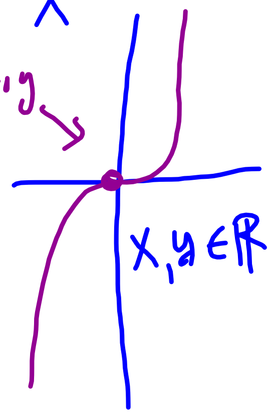
$= \boxed{3\sqrt{x-1} - 9}$

3) Review characteristics of the square root function $f(x) = \sqrt{x}$ and cubic root function $\sqrt[3]{x}$ on your own.

$\sqrt{x}$ sq root $\qquad \sqrt[3]{x}$ cubic rt $\qquad x^3$ cubic







Feb 26-8:31 AM