PreCalculus
Cumulative Review

#1) Find the domain of the given function. Use interval notation.

$$f(x) = \sqrt{5 - x}$$

RADICAND ≥ 0

$5 - x \geq 0$

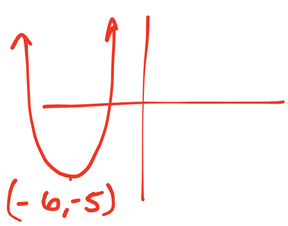
$5 \geq x$

$x \leq 5$

$(-\infty, 5]$

#2) Find the range of the given function. Use interval notation.

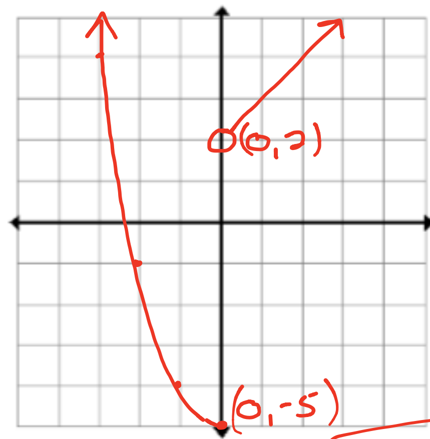
$$f(x) = (x + 6)^2 - 5$$



$[-5, \infty)$

#3) Sketch the piecewise function and answer the questions.

$$f(x) = \begin{cases} x^2 - 5 & x \leq 0 \\ x + 2 & x > 0 \end{cases}$$



a. $f(-2) = -1$

b. $f(2) = 4$

c. $f(0) = -5$

$f(-2) = (-2)^2 - 5$
$= 4 - 5$
$f(-2) = -1$

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

#4) Confirm that f and g are inverses by showing that $f\big(g(x)\big) = x$

$f(x) = 3x - 5$ and $g(x) = \frac{x+5}{3}$

$f(g(x)) = 3(g(x)) - 5$

$= 3\left(\frac{x+5}{3}\right) - 5$

$= x + 5 - 5$

$f(g(x)) = x$

$\therefore$ f & g are inverses

#5) If $f(x) = 5x + 7$ and $g(x) = x^3 + 4x^2 - 3$, find the following:

$f(g(0)) = 5(g(0)) + 7$

$= 5((0)^3 + 4(0)^2 - 3) + 7$

$= 5(-3) + 7$

$= -15 + 7$

$f(g(0)) = -8$

OR

$g(0) = (0)^3 + 4(0)^2 - 3$

$g(0) = -3$

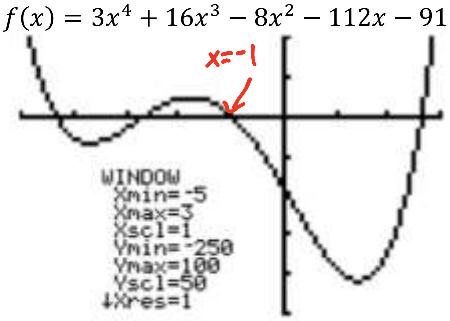
$f(-3) = 5(-3) + 7$

$= -15 + 7$

$f(-3) = -8$

#6) Use the graph of the function to determine at least one zero, then find the exact values of all the zeros using the Factor Theorem.

$f(x) = 3x^4 + 16x^3 - 8x^2 - 112x - 91$



$\boxed{-1}$	3	16	-8	-112	-91
		-3	-13	21	91
	3	13	-21	-91	$\boxed{0}$

$f(x) = (x+1)[3x^3 + 13x^2 - 21x - 91]$

$f(x) = (x+1)[(3x^3 + 13x^2) + (-21x - 91)]$

$f(x) = (x+1)[x^2(3x+13) + {}^-7(3x+13)]$

$0 = (x+1)(3x+13)(x^2-7)$

$0 = x+1$ | $0 = 3x+13$ | $0 = x^2 - 7$

$-1 = x$ | $-13 = 3x$ | $7 = x^2$

$-\frac{13}{3} = x$ | $\pm\sqrt{7} = x$

$\therefore$ x-int $= -1, -\frac{13}{3}, \pm\sqrt{7}$

Answer the following questions about the given function.

$y = -2(3x - 12)^3 - 15$

$y = -2[3(x-4)]^3 - 15$

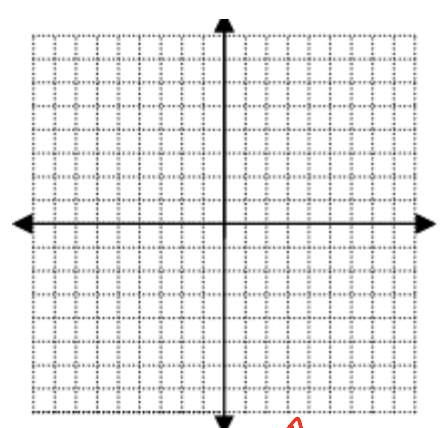
#7) Name Function: Cubic

#8) Translation: Right 4
Down 15

#9) Scale: Stretch vertically by 2
Shrink horizontally by $\frac{1}{3}$

#10) Reflection: Vertical Reflection

#11) Sketch Graph



(4,-15)

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#12) Solve.

$$\frac{\cancel{(x+5)}(x-2)\,3x}{\cancel{x+5}} = \frac{\cancel{(x+5)(x-2)}\,-7}{\cancel{x^2+3x-10}} + \frac{(x+5)\cancel{(x-2)}\,1}{\cancel{x-2}}$$

$3x(x-2) = -7 + (x+5)$

$3x^2 - 6x = x - 2$

$3x^2 - 7x + 2 = 0$

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

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

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

$3x-1=0$, $3x=1$, $x=\frac{1}{3}$; $x-2=0$, $x=2$

Denom $\neq 0$

$\boxed{x+5\neq 0,\ x\neq -5 \quad x-2\neq 0,\ x\neq 2}$

$\therefore x = \frac{1}{3}$

#13) Simplify.

$$\frac{(x+2)}{(\sqrt{x}-\sqrt{x+5})}\cdot\frac{(\sqrt{x}+\sqrt{x+5})}{(\sqrt{x}+\sqrt{x+5})}$$

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

$$= \frac{(x+2)(\sqrt{x}+\sqrt{x+5})}{x-(x+5)}$$

$$= \frac{(x+2)(\sqrt{x}+\sqrt{x+5})}{-5}$$

#14) Evaluate

$\log_3 81 = \log_3 3^4$

$= 4$

Use $f(x) = \frac{4x}{x^3-25x}$ to answer the following questions.

#15) Vertical Asymptotes/Holes:

$f(x) = \frac{4x}{x(x^2-25)}$

$f(x) = \frac{4x}{x(x-5)(x+5)}$

Cancel Holes: $x=0$

Left VA: $(x-5)(x+5)=0$; $x-5=0$, $x=5$; $x+5=0$, $x=-5$

$\therefore$ Hole @ $x=0$, VA @ $x=\pm 5$

#16) x-intercepts:

$0 = 4x$

$0 = x$, there is a hole @ $x=0$, so no x-int

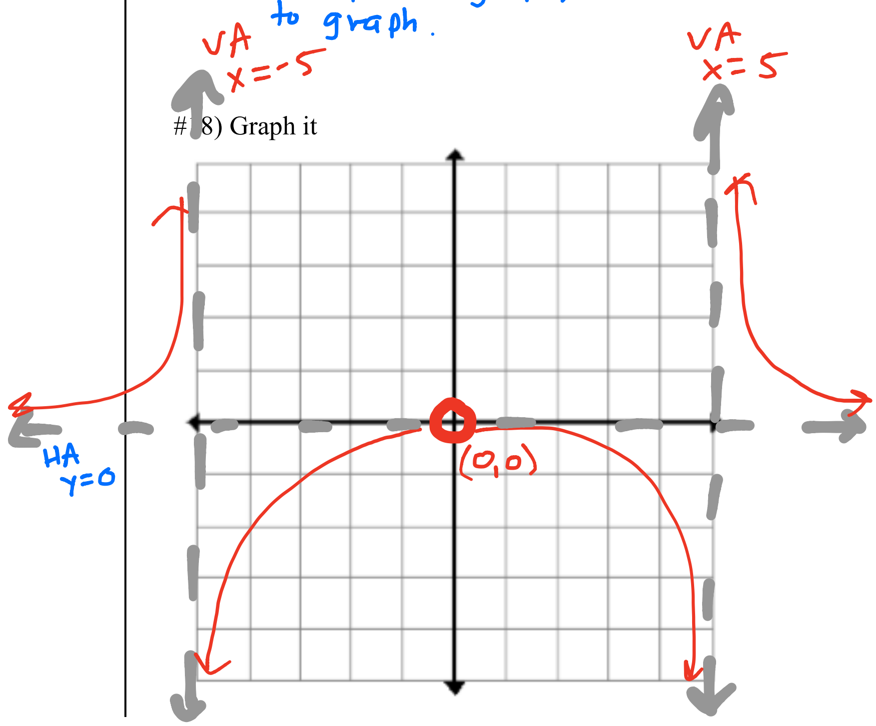
#17) Horizontal/Slant Asymptotes:

$n \overset{?}{=} d$

$0 < 2$, so HA @ $y=0$

Not a parent graph, so use calc to graph.

#18) Graph it



Use the information given to answer the questions on this page.

The formula for the path of a flying bullet is given: $h = -9.8t^2 + vt + s$ where h = height of object after t seconds, v = initial velocity in meters per second and s = starting height in meters.

Bob shoots a gun straight up with an initial velocity of 200 meters per second and a starting height of 3 meters.

#19) What is the equation that represents this situation?

$h = -9.8t^2 + 200t + 3$

#20) What does the y-intercept represent to Bob?

The y-intercept represents the height of the bullet when Bob pulls the trigger

#21) What do the x-intercepts represent to Bob?

The x-intercepts represent how many seconds it takes for the bullet to reach a height of zero, which is ground height.

#22) How high is the bullet after 4 seconds?

$h = -9.8t^2 + 200t + 3$

$h(4) = -9.8(4)^2 + 200(4) + 3$

$= -9.8(16) + 800 + 3$

$= -156.8 + 803$

$h(4) =$ 646.2 meters

#23) How long will it take for the bullet to hit the ground after it is fired?

$0 = -9.8t^2 + 200t + 3$

Doesn't factor. Ask calculator for "zero" of function.

$t \approx 20.423$ seconds

#24) What is the maximum height of the bullet?

Use calc to find "MAX"

1023.408 meters

#25) At what time(s) will the bullet be 500 meters in the air?

$Y_1 = -9.8t^2 + 200t + 3$

$Y_2 = 500$

Ask calc for "intersect"

$t \approx 2.896$ seconds and 17.512 seconds