480/81
Day 3
HW

GRAPH RATIONAL FUNCTIONS AND REVIEW STUFF

Name ______________________

Date ______________ Period ____

Fill in all the information, and graph each rational function.

1) $f(x) = \dfrac{x^3 + 3x^2 - x - 3}{x+1}$

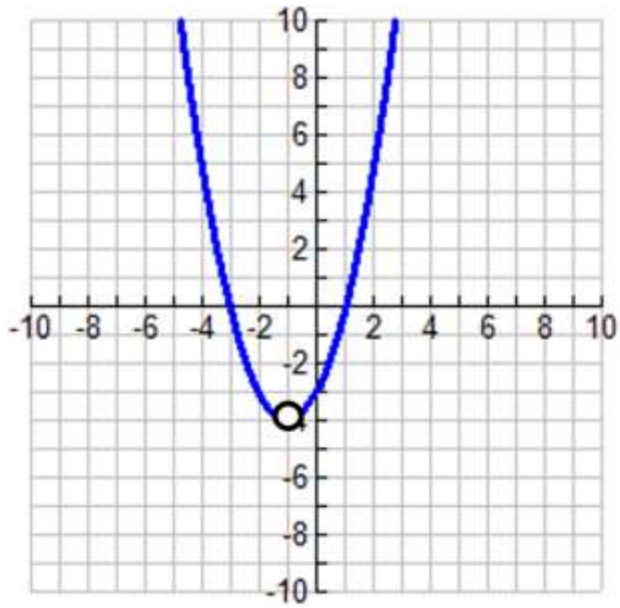
$f(x) \dfrac{x^2(x+3) - 1(x+3)}{x+1} = \dfrac{(x^2-1)(x+3)}{(x+1)} = \dfrac{(\cancel{x+1})(x-1)(x+3)}{(\cancel{x+1})}$

$f(x) = (x-1)(x+3)$ Quadratic!

$= x^2 + 2x - 3$

vertex: $-\frac{b}{2a} = \frac{-2}{2(1)} = -1$

$(-1, -4)$



hole(s): $(-1, -4)$

x – int: $(1, 0)\ (-3, 0)$

y – int: $(0, -3)$

VA: DNE

HA: DNE

2) $f(x) = \dfrac{2x^2 - 2x - 24}{x^2 + x - 12} = \dfrac{2(x^2 - x - 12)}{(x^2 + x - 12)} = \dfrac{2(x-4)(x+3)}{(x+4)(x-3)}$

x int: $y = 0$

$0 = \dfrac{2(x-4)(x+3)}{(x+4)(x-3)}$

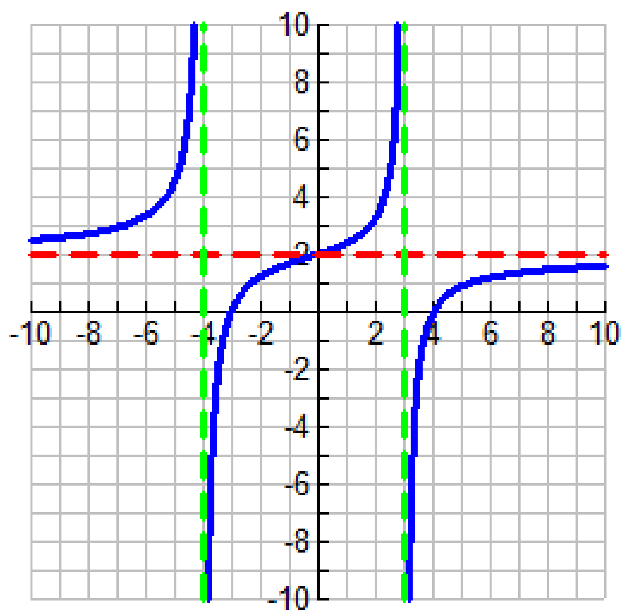
$0 = 2(x-4)(x+3)$

$x = 4, -3$

y int: $x = 0$

$f(0) = \dfrac{2(-4)(3)}{(4)(-3)}$

$f(0) = 2$



hole(s): DNE

x – int: $(4, 0)(-3, 0)$

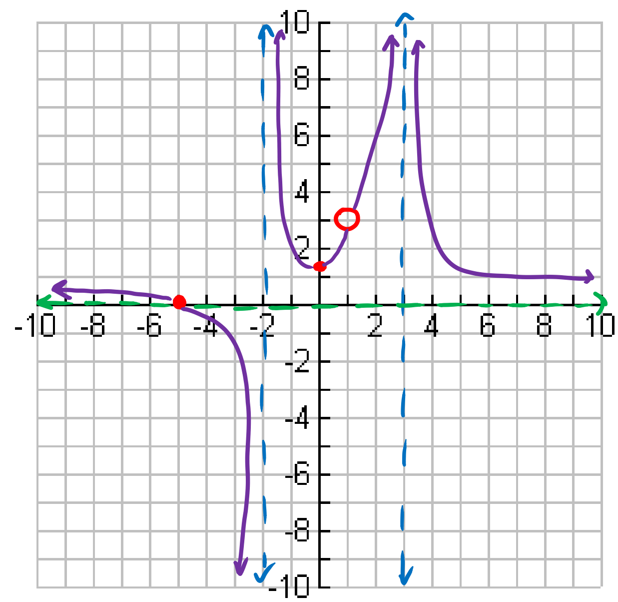
y – int: $(0, 2)$

VA: $x = {}^-4 \quad x = 3$

HA: $y = 2$

3) $f(x)=\dfrac{(x+5)^2\cancel{(x-1)}}{\cancel{(x-1)}(x+2)(x-3)^2}$

$f(x)=\dfrac{(x+5)^2}{(x+2)(x-3)^2}$



hole(s): $(1,3)$

x – int: $(-5,0)$

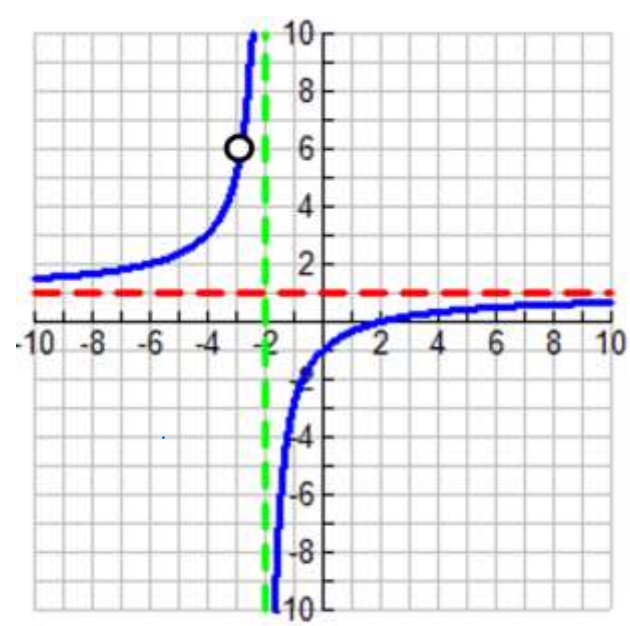
y – int: $(0,\frac{25}{18})$

VA: $x=-2$ $x=3$

HA: $y=0$

4) $f(x)=\dfrac{x^2+x-6}{x^2+5x+6}=\dfrac{\cancel{(x+3)}(x-2)}{\cancel{(x+3)}(x+2)}$

$f(x)=\dfrac{x-2}{x+2}$



hole(s): $(-3,5)$

x – int: $(2,0)$

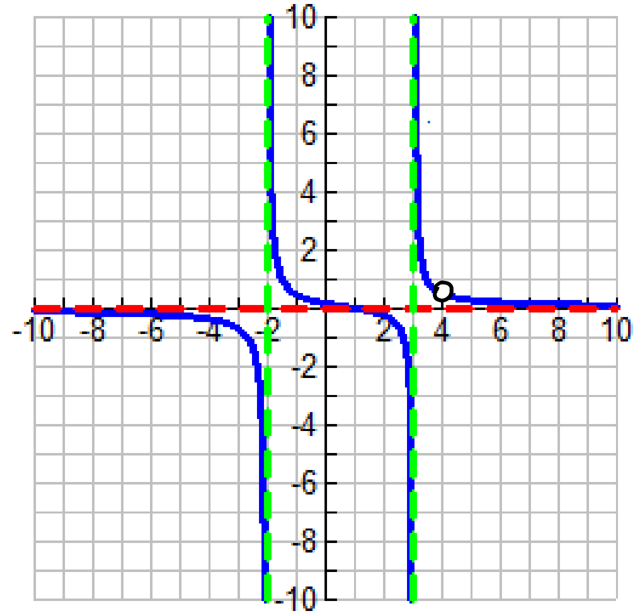
y – int: $(0,-1)$

VA: $x=-2$

HA: $y=1$

5) $f(x)=\dfrac{(x-1)\cancel{(x-4)}}{\cancel{(x-4)}(x-3)(x+2)}$

$f(x)=\dfrac{(x-1)}{(x-3)(x+2)}$



hole(s): $(4, \frac{1}{2})$

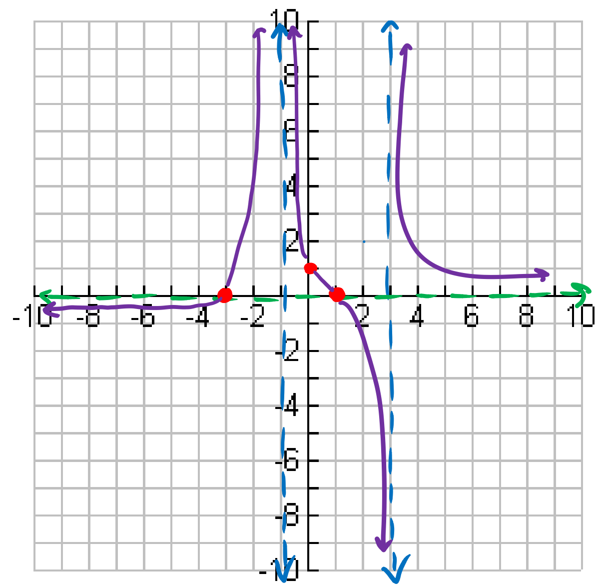
x – int: $(1,0)$

y – int: $(0, \frac{1}{6})$

VA: $x=3 \quad x=-2$

HA: $y=0$

6) $f(x)=\dfrac{(x-1)(x+3)}{(x+1)^2(x-3)}$



hole(s): DNE

x – int: $(1,0)$ $(-3,0)$

y – int: $(0, 1)$

VA: $x=-1 \quad x=3$

HA: $y=0$

7. Given the sets of data below: 1) Name the type of function that best fits the data, and
2) Write the particular equation that fits the data.

A)

x	y
1	–2
3	22
5	70
7	142
9	238

+2, +2, +2, +2; +24, +48, +72; +24, +24

Quadratic:

(use 3 pts in $ax^2+bx+c=y$ then use matrix)

$$\begin{bmatrix} 1 & 1 & 1 & -2 \\ 9 & 3 & 1 & 22 \\ 25 & 5 & 1 & 70 \end{bmatrix} \xrightarrow{RREF} \begin{bmatrix} 1 & 0 & 0 & 3 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -5 \end{bmatrix}$$

$\boxed{y = 3x^2 - 5}$

B)

x	y
–8	13122
–6	1458
–4	162
–2	18
0	2

+2, +2, +2, +2; $\cdot\frac{1}{9}$, $\cdot\frac{1}{9}$, $\cdot\frac{1}{9}$

Exponential:

$y = a(b)^x$

$y = 2(b)^x$

$18 = 2(b)^{-2}$

$b = \frac{1}{3}$

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

C)

x	y
0	4
3	6
6	8
9	10

+3, +3, +3; +2, +2, +2

Linear:

$y = mx + b$

$\frac{\Delta y}{\Delta x} = \frac{2}{3}$

$b = 4$

$\boxed{y = \frac{2}{3}x + 4}$

D)

x	y
1	4
2	1
4	.25
8	.0625

$\cdot 2$, $\cdot 2$, $\cdot 2$; $\cdot\frac{1}{4}$, $\cdot\frac{1}{4}$, $\cdot\frac{1}{4}$

Inverse Variation:

$y = \frac{k}{x^2}$

$4 = \frac{k}{1^2}$

$k = 4$

$\boxed{y = \frac{4}{x^2}}$

8. You are looking to buy a new car and decide to do some research about the depreciation of the cars. Your first choice has a purchase price of \$42,000, but its value decreases by 30% each year. Your second, more affordable but not as sporty, choice has a purchase price of \$25,000 and will only depreciate by 15% each year.

a) How much will each car be worth in 2 years? 5 years? 10 years?

$y_1 = 42{,}000(1-.30)^x$ $\qquad$ $y_2 = 25{,}000(1-.15)^x$

Car 1: @ 2 yrs: \$20,580 $\qquad$ Car 2: \$18,062.50

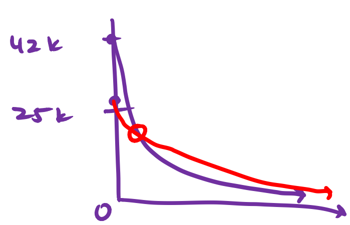
@ 5 yrs: \$7,058.94 $\qquad$ \$11,092.63

@ 10 yrs: \$1,186.40 $\qquad$ \$4,921.86

b) Write an equation to represent the value of each car after n years.

$y = 42{,}000(.7)^n$ $\qquad$ $y = 25{,}000(.85)^n$

c) Draw a quick sketch of each equation to answer the following question.



d) How long before the cars are worth the same amount?

$42{,}000(.7)^x = 25{,}000(.85)^x$ $\qquad$ ≈ 2.67 yrs they are worth \$16,193.

9. a. Write a general equation for: y varies inversely with the square of x.

$y = \frac{k}{x^2}$

b. What happens to the value of y when x is tripled, in the variation above?

y decreases by a factor of $\frac{1}{9}$ / y is multiplied by a factor of $\frac{1}{9}$

10. a. Write a general equation for: y varies directly with the cube of x.

$y = kx^3$

b. What happens to the value of y when x is multiplied by one-fifth, in the variation above?

y will decrease by a factor of $\frac{1}{125}$ / y will be multiplied by a factor of $\frac{1}{125}$

11. **The points (7, 45) and (21, 5) fit a variation function.**

a. Which kind of variation function does the data represent?

Inverse Variation

x	y
7	45
21	5

$\cdot 3$; $\cdot \frac{1}{9}$

b. Write the particular equation for the function.

$y = \frac{k}{x^2}$ $45 = \frac{k}{49}$ $k = 2205$ $\boxed{y = \frac{2205}{x^2}}$

12. The mass of an orange varies directly with the cube of its diameter. If a Florida orange has twice the diameter of a California orange and the Florida orange weighs 6 oz. How much does the California orange weigh?

d= diameter

m= mass

$m = k \cdot d^3$

If d is cut in half, then mass is decreased by a factor of $\frac{1}{8}$.

So the mass of the California orange is $\frac{1}{8}$ times smaller than the Florida orange.

$m = 6 \cdot \frac{1}{8} = \boxed{\frac{3}{4} \text{ oz.}}$ ← Answer