Name: Key Date: ______ Period: ______

Secondary Math 3 Honors Rational Functions Test Review

Simplify each rational expression fully and state what the excluded values are.

1. $$\frac{3-2r-r^2}{r^2-10r+9}$$

$$=\frac{-(r^2+2r-3)}{(r-9)(r-1)}=\frac{-(r+3)\cancel{(r-1)}}{(r-9)\cancel{(r-1)}}$$

$$\boxed{\frac{-(r+3)}{r-9}}$$

exc. val: $r=9, 1$

2. $$\frac{5n^2+15n}{9n^2+27n}=\frac{5\cancel{n}\cancel{(n+3)}}{9\cancel{n}\cancel{(n+3)}}=\boxed{\frac{5}{9}}$$

excl. val: $n=0,-3$

Add or subtract each rational expression. Fully simplify your answer.

3. $$\left(\frac{x+2}{x+2}\right)\frac{6x}{x+4}-\frac{3}{x+2}\left(\frac{x+4}{x+4}\right)$$

$$\frac{6x^2+12x-3x-12}{(x+2)(x+4)}=$$

$$\frac{6x^2+9x-12}{(x+2)(x+4)}=\frac{3(2x^2+3x-4)}{(x+2)(x+4)}=$$

4. $$\frac{3}{6a}-\frac{a-2}{a+4}=\frac{3a+12-(6a^2-12a)}{6a(a+4)}=$$

$$\frac{-6a^2+15a+12}{6a(a+4)}=\frac{-\cancel{3}^{1}(2a^2-5a-4)}{2\cancel{6}a(a+4)}$$

$$\frac{-(2a^2-5a-4)}{2a(a+4)}$$

Multiply or divide each rational expression. Fully simplify your answer.

-8

5. $$\frac{x^2-11x+30}{x-5}\cdot\frac{6x}{8}=$$

$$\frac{\cancel{(x-5)}(x-6)\cancel{6}^{3}x}{\cancel{(x-5)}\cancel{8}_{4}}=$$

$$\frac{3x(x-6)}{4}$$

6. $$\frac{1}{n-9}\div\frac{n-9}{n^2-17n+72}$$

$$\frac{1(n-8)\cancel{(n-9)}}{(n-9)\cancel{(n-9)}}=\frac{n-8}{n-9}$$

Solve each equation. Remember to check for extraneous solutions.

7. $\left(\dfrac{1}{3r} + \dfrac{r+3}{3r} = \dfrac{1}{r}\right) 3r$ $\quad r \neq 0$

$1 + r + 3 - 3 = 0$

$r = -1$

8. $\left(\dfrac{3}{k^2 - 5k} + \dfrac{6}{k} = \dfrac{1}{k-5}\right) k(k-5)$ $\quad k \neq 5, 0$

$k^2 - 5k = k(k-5)$

$3 + 6(k-5) - k = 0$

$3 + 6k - 30 - k = 0$

$-27 + 5k = 0$

$5k = 27$

$k = \dfrac{27}{5}$

Graph each rational function below. Write out or label any vertical, horizontal, or slant asymptotes; any x- and y-intercepts; holes. If there aren't any of what's asked for above, write "none."

9.

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

eb → −2

$2 = \dfrac{2}{x+3}$

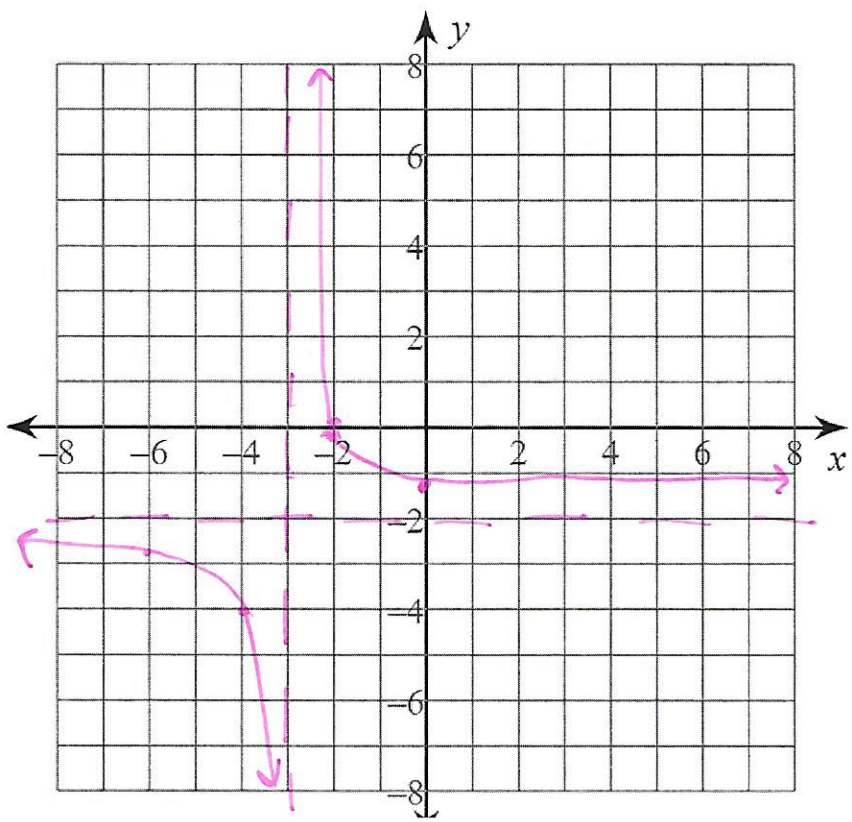
$2x + 6 = 2$

$2x = -4$

$x = -2$

$\dfrac{2}{3} - \dfrac{6}{3}$

$-\dfrac{4}{3}$



Horizontal Asymptote(s): $y = -2$

Vertical Asymptote(s): $x = -3$

Slant Asymptote(s): none

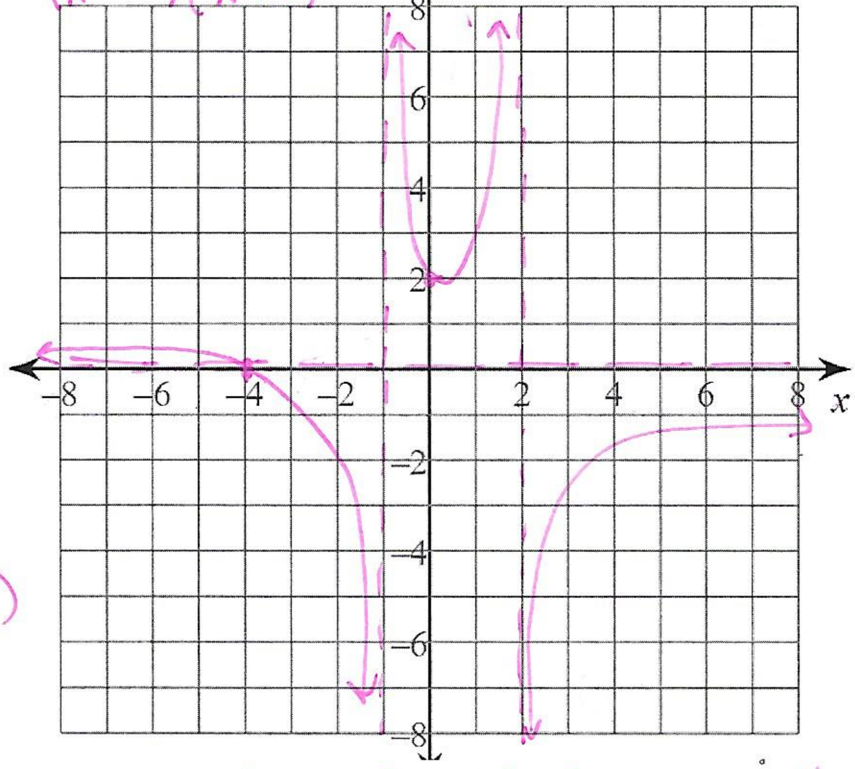
x-intercept(s): $(-2, 0)$

y-intercept(s): $\left(0, -\frac{4}{3}\right)$

Hole(s): none

10. $f(x) = \dfrac{-x-4}{x^2-x-2} = \dfrac{-(x+4)}{(x-2)(x+1)}$

proper - e.b → 0



$+ \quad - \quad + \quad + \quad -$

$-5 \quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3$

$\frac{1}{-7\cdot -4} \quad \frac{-2}{-4\cdot -1} \quad \frac{-5}{-1\cdot 2} \quad \frac{-7}{1\cdot 4}$

Horizontal Asymptotes: $x = 2, -1$

Vertical Asymptotes: $y = 0$

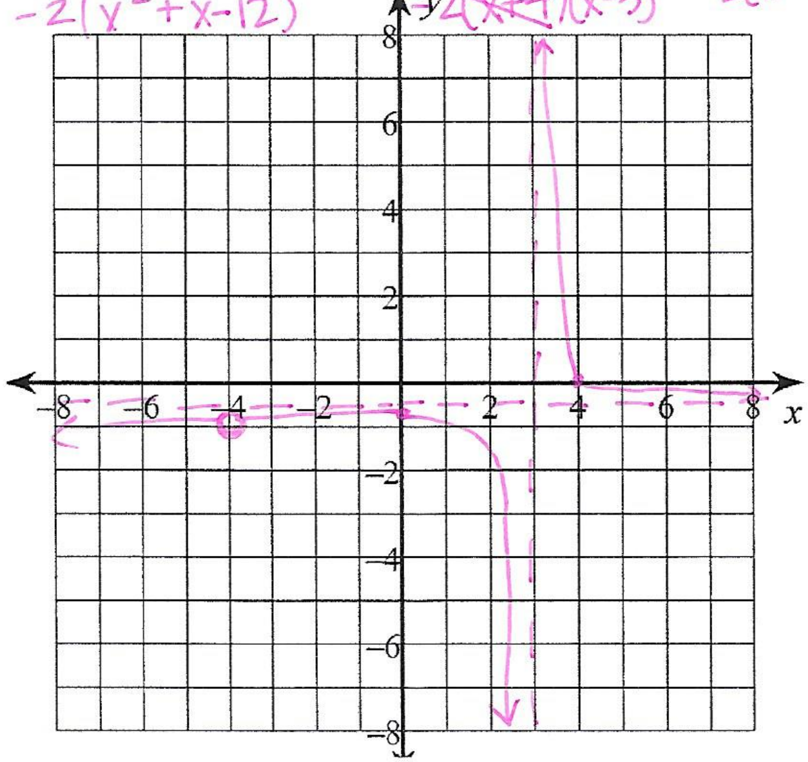
Slant Asymptotes: none

x-intercept: $x = -4$ $(-4, 0)$

y-intercept: $y = \frac{-4}{-2} = 2$ $(0, 2)$

Holes: none

11. $f(x) = \dfrac{x^2-16}{-2x^2-2x+24} = \dfrac{(x+4)(x-4)}{-2(x^2+x-12)} = \dfrac{\cancel{(x+4)}(x-4)}{-2\cancel{(x+4)}(x-3)} = \dfrac{x-4}{-2(x-3)}$



Horizontal Asymptote(s): $y = -\frac{1}{2}$

Vertical Asymptote(s): $x = 3$

Slant Asymptote(s): none

x-intercept(s): $x = 4$ $(4, 0)$

y-intercept(s): $y = -\frac{4}{6} = -\frac{2}{3}$

Hole(s): $x = -4$

12.

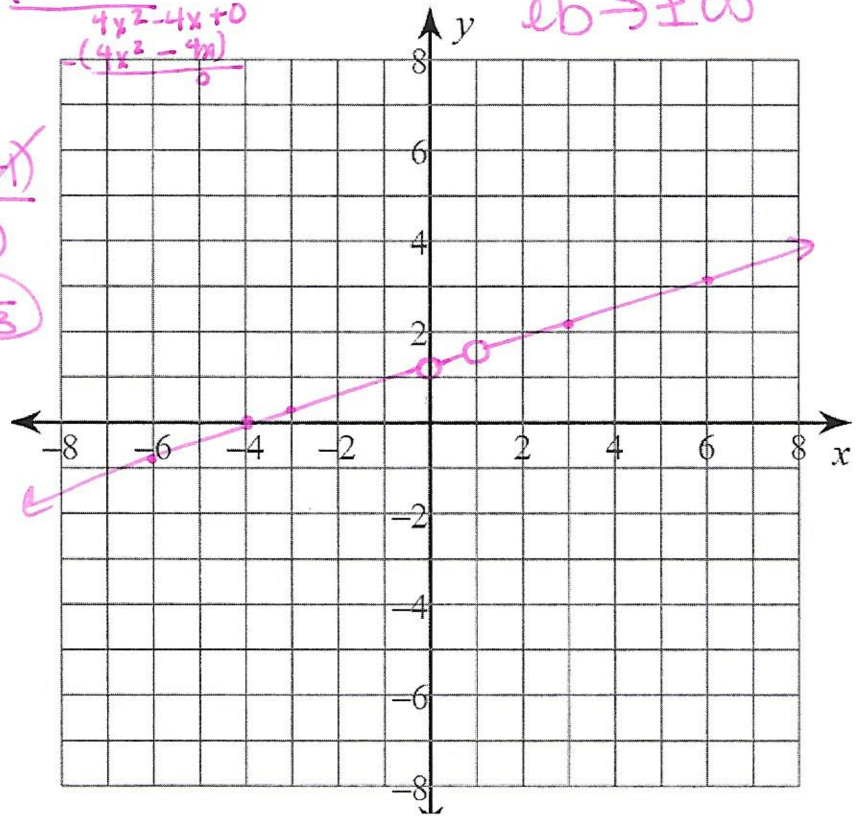
$$\frac{\frac{1}{3}x + \frac{4}{3}}{3x^2-3x\,)\,x^3+3x^2-4x+0}$$
$-(x^3 - x^2)$
$4x^2-4x+0$
$-(4x^2-4x)$
0

improper

eb $\to \pm\infty$

$$f(x) = \frac{x^3 + 3x^2 - 4x}{3x^2 - 3x}$$

$$\frac{x(x^2+3x-4)}{3x(x-1)} = \frac{\cancel{x}(x+4)\cancel{(x-1)}}{3\cancel{x}\cancel{(x-1)}} = \boxed{\frac{x+4}{3}} = \frac{1}{3}x + \frac{4}{3}$$



Horizontal Asymptote(s): none

Vertical Asymptote(s): none

Slant Asymptote(s): $y = \frac{1}{3}x + \frac{4}{3}$

x-intercept(s): -4 $(-4, 0)$

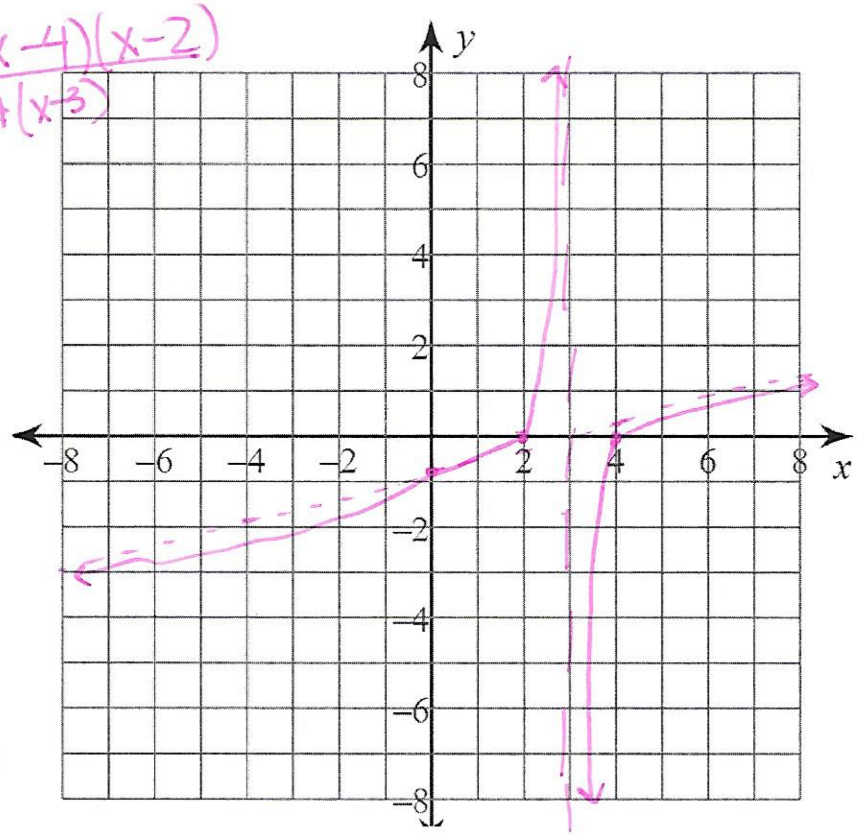
y-intercept(s): $\frac{4}{3}$ $(0, \frac{4}{3})$

Hole(s): $x = 0, 1$

No calculator below. State the asymptotes, intercepts, and holes. Sketch a graph of the following.

$$f(x) = \frac{x^2 - 6x + 8}{4x - 12} = \frac{(x-4)(x-2)}{4(x-3)}$$

$$\frac{\frac{1}{4}x - \frac{3}{4}}{4x-12\,)\,x^2-6x+8}$$
$-(x^2 - 3x)$
$-3x+8$
$-(-3x+8)$
0



Horizontal Asymptote(s): none

Vertical Asymptote(s): $x = 3$

Slant Asymptote(s): $y = \frac{1}{4}x - \frac{3}{4}$

x-intercept(s): $x = 4, 2$

y-intercept(s): $y = \frac{8}{-12} = -\frac{3}{4}$ $(0, -3/4)$

Hole(s): none

$-$ $-$ $+$ $-$ $+$

-1 0 2 2.5 3 3.5 4 5

$\frac{-5 \cdot -3}{4 \cdot -2}$ $\frac{- \cdot +}{+ \cdot -}$ $\frac{- \cdot +}{+ \cdot +}$ $\frac{1 \cdot 3}{4 \cdot 2}$