UNIT 6 Rational Functions **NAME:**___________________________

TEST CA

DATE:_______

REVIEW SKILLS

Simplify. Use only positive exponents. (1 pt each)

1) $4x^3(5x^{-6})$	2) $\frac{10y^7}{4y^4}$	3) $(2h^3)^{-2}$	4) $\left(\frac{2m^9n^{10}\cdot 2m^8n^7}{(m^8n^3)^5}\right)^3$

Directions: Solve each equation. Remember to check for extraneous solutions. 4 points each.

5) $\frac{2x}{x+2} = \frac{5}{x^2-x-6} - \frac{1}{x-3}$	6) $\frac{2x}{x-3} + \frac{2}{x-5} = \frac{3x}{x^2-8x+15}$

Directions: Simplify. 3 points each.

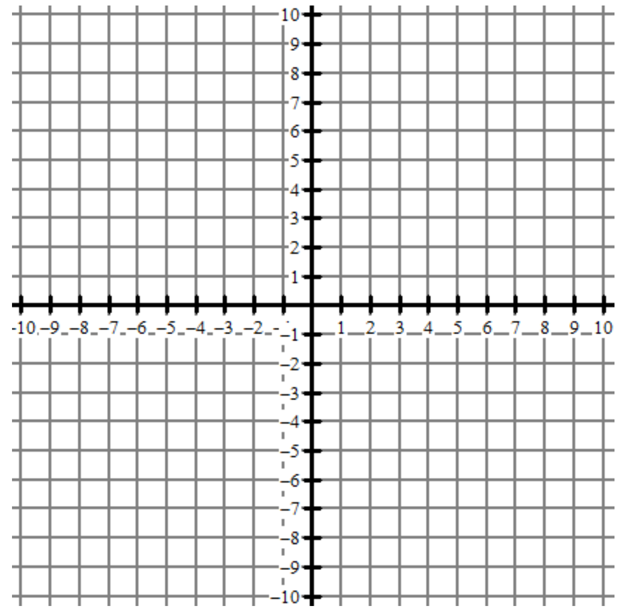
7) $\dfrac{\frac{2x}{x-5} - \frac{5}{x}}{\frac{x+5}{x-5} + \frac{x-2}{x^2}}$	8) $\dfrac{\frac{3g}{g-5} + 2}{\frac{3}{g-5} - 4}$	9) $\dfrac{2-3y}{\sqrt{2-y} + \sqrt{y+6}}$

DIRECTIONS: Translate each statement into an equation using k as the constant of variation. 2 points each.

10) L is directly proportional to the cube of m.	11) S is directly proportional to the square root of u and inversely proportional to v.	12) The f-stop numbers N on a camera, known as focal ratios, are directly proportional to the focal length F of the lens and inversely proportional to the diameter, d, of the effective lens opening.

Directions: Find each value and graph. 2 points each.

10) $y = \frac{2x^3+7x^2+3x}{x^2+4x+4}$



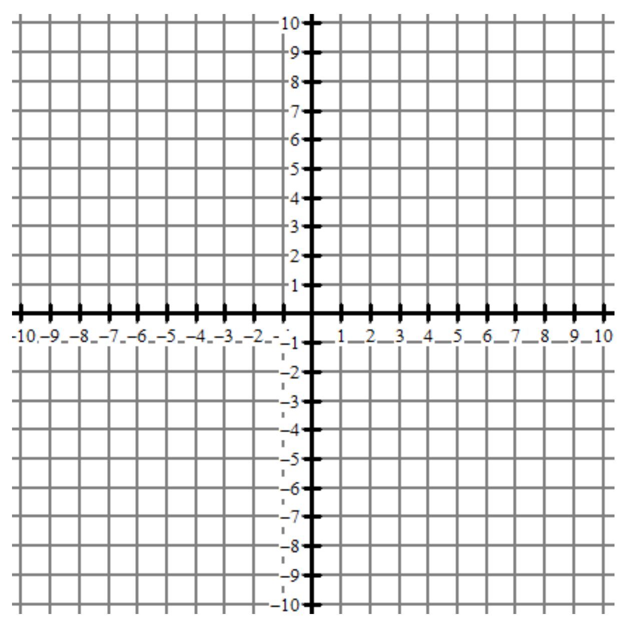
Hole/Vertical Asymptotes:

Y-Int:

X-int:

Horizontal/Slant Asymptote:

11) $y = \frac{3x^2+15x+18}{x^2+4x-5}$



Hole/Vertical Asymptotes:

Y-Int:

X-int:

Horizontal/Slant Asymptote:

Directions: Solve each. 4 points each.		
12) I is directly proportional to the cube root of y. If I = 5 when y = 64, find I when y = 8.	13) If y varies jointly as a and b and inversely as the square root of c, and y = 12 when a = 3, b = 2, and c = 64, find y when a = 5, b = 2, and c = 25.	14) The number of minutes needed to solve an exercise set of variation problems varies directly as the number of problems and inversely as the numb of people working on the solutions. It takes 4 people 36 minutes to solve 18 problems. How many minutes will it tak 6 people to solve 42 problems?

APPLICATION

RULES AND PROPERTIES OF WORK: If two entities are working on the same job, and the first would take *a* hours to complete the job alone and the second *b* hours to complete the job alone, then the equations $\frac{1}{a}+\frac{1}{b}=\frac{1}{t}$, can be used to find *t,* the time it will take to complete the job together.

1) Kelly can clean his house in *h* hours. His kids can clean the house in 5 hours more than him. If they join forces they can clean the whole house in 6 total hours. How long does it take each of them to do it separately?

Kelly: ____________________________ Kelly's Kids: _______________________________

2) FINDING THE DERIVATIVE. In Calculus the definition of a derivative is $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$.
Let f(x) = $2x^2 - 5x$

a) Plug f(x) and f(x+h) into the derivative formula and simplify. 3 points.

b) Reduce your simplified function by factoring our a common factor of h. What is the derivative of f(x)? 3 points.

UNIT 6 Rational Functions

TEST CA

NAME:______________________

DATE:_______

REVIEW SKILLS

Simplify. Use only positive exponents. (1 pt each)

1) $4x^3(5x^{-6})$

$20x^{-3}$

$\boxed{\frac{20}{x^3}}$

2) $\frac{10y^7}{4y^4} = \boxed{\frac{5}{2}y^3}$

3) $(2h^3)^{-2}$

$2^{-2}h^{-6}$

$\frac{1}{2^2h^6} = \boxed{\frac{1}{4h^6}}$

4) $\left(\frac{2m^9n^{10}\cdot 2m^8n^7}{(m^8n^3)^5}\right)^3$

$\left(\frac{4m^{17}n^{17}}{m^{40}n^{15}}\right)^3 = \left(4m^{-23}n^2\right)^3$

$\left(\frac{4^3n^6}{m^{69}}\right) = \boxed{\frac{64n^6}{m^{69}}}$

Directions: Solve each equation. Remember to check for extraneous solutions. 4 points each.

5) $\left(\frac{2x}{x+2} = \frac{5}{x^2-x-6} - \frac{1}{x-3}\right)(x+2)(x-3)$

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

$2x^2 - 6x = 5 - x - 2$

$2x^2 - 5x - 3 = 0$

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

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

$x - 3 = 0 \qquad 2x+1 = 0$

$\cancel{x=3} \qquad 2x = -1$

$\boxed{x = -\frac{1}{2}}$

6) $\left(\frac{2x}{x-3} + \frac{2}{x-5} = \frac{3x}{x^2-8x+15}\right)(x-3)(x-5)$

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

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

$2x^2 - 11x - 6 = 0$

$(2x-12)(2x+1) = 0$

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

$\boxed{x = 6 \text{ or } x = -\frac{1}{2}}$

Directions: Find each value and graph. 3 points each.

10) $y = \frac{2x^3+7x^2+3x}{x^2+4x+4} = \frac{x(2x^2+7x+3)}{(x+2)(x+2)} = \frac{x(x+3)(2x+1)}{(x+2)(x+2)}$

Hole/Vertical Asymptotes: $x = -2$ vertical asym.

Y-int: $\frac{2(0)^3+7(0)^2+3(0)}{(0)^2+4(0)+4} = (0, 0)$

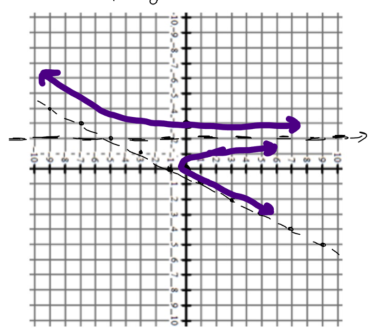
X-int: $0 = \frac{x(x+3)(2x+1)}{(x+2)(x+2)}$

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

$0 = x \qquad x+3 = 0 \qquad 2x+1 = 0$

$x = -3 \qquad x = -\frac{1}{2}$

Horizontal/Slant Asymptote: $2x-1$



Directions: Simplify. 3 points each.

7) $\dfrac{\frac{2x}{x-5} - \frac{5}{x}}{\frac{x+5}{x-5} + \frac{x-2}{x^2}} \cdot \dfrac{(x-5)(x^2)}{(x-5)(x^2)}$

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

$\frac{2x^3 - 5x^2 + 25x}{x^3 + 5x^2 + x^2 + 3x - 10}$

$\boxed{\frac{2x^3 - 5x^2 + 25x}{x^3 + 6x^2 + 3x - 10}}$

8) $\dfrac{\frac{3g}{g-5} + 2}{\frac{3}{g-5} - 4} \cdot \dfrac{(g-5)}{(g-5)}$

$\frac{3g + 2(g-5)}{3 - 4(g-5)} = \frac{3g + 2g - 10}{3 - 4g + 20}$

$\boxed{\frac{5g - 10}{-4g + 23}}$

9) $\frac{2-3y}{\sqrt{2-y} + \sqrt{y+6}} \cdot \frac{(\sqrt{2-y} - \sqrt{y+6})}{(\sqrt{2-y} - \sqrt{y+6})}$

$\frac{(2-3y)(\sqrt{2-y} - \sqrt{y+6})}{(2-y) - (y+6)}$

$\boxed{\frac{(2-3y)(\sqrt{2-y} - \sqrt{y+6})}{-2y - 4}}$

11) $y = \frac{3x^2+15x+18}{x^2+4x-5} = \frac{3(x^2+5x+6)}{(x+5)(x-1)} = \frac{3(x+2)(x+3)}{(x+5)(x-1)}$

Hole/Vertical Asymptotes: $x = -5$, $x = 1$ Vert Asym.

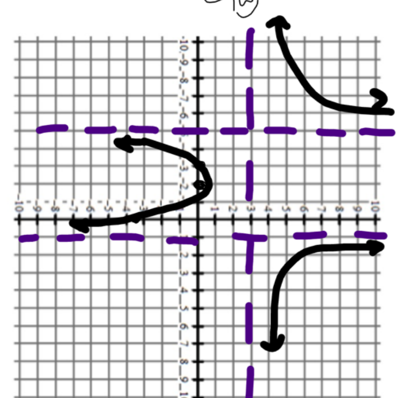
Y-Int: $\frac{3(0)^2+15(0)+18}{(0)^2+4(0)-5}$ $\left(0, -\frac{18}{5}\right)$

X-int: $0 = \frac{3(x+2)(x+3)}{(x+5)(x-1)}$

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

$x = -2, \quad x = -3$

Horizontal/Slant Asymptote: $y = 3$



Directions: Simplify. 3 points each.

7) $\dfrac{\frac{2x}{x-5} - \frac{5}{x}}{\frac{x+5}{x-5} + \frac{x-2}{x^2}} \cdot \dfrac{(x-5)(x^2)}{(x-5)(x^2)}$

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

$\frac{2x^3 - 5x^2 + 25x}{x^3 + 5x^2 + x^2 + 3x - 10}$

$\boxed{\frac{2x^3 - 5x^2 + 25x}{x^3 + 6x^2 + 3x - 10}}$

8) $\dfrac{\frac{3g}{g-5} + 2}{\frac{3}{g-5} - 4} \cdot \dfrac{(g-5)}{(g-5)}$

$\frac{3g + 2(g-5)}{3 - 4(g-5)} = \frac{3g + 2g - 10}{3 - 4g + 20}$

$\boxed{\frac{5g - 10}{-4g + 23}}$

9) $\frac{2-3y}{\sqrt{2-y} + \sqrt{y+6}} \cdot \frac{(\sqrt{2-y} - \sqrt{y+6})}{(\sqrt{2-y} - \sqrt{y+6})}$

$\frac{(2-3y)(\sqrt{2-y} - \sqrt{y+6})}{(2-y) - (y+6)}$

$\boxed{\frac{(2-3y)(\sqrt{2-y} - \sqrt{y+6})}{-2y - 4}}$

Directions: Solve each. 4 points each.

12) I is directly proportional to the cube root of y. If I = 5 when y = 64, find I when y = 8.

$I = k\sqrt[3]{y}$

$5 = k\sqrt[3]{64}$

$5 = k \cdot 4$

$\frac{5}{4} = k$

$I = \frac{5}{4}\sqrt[3]{8}$

$I = \frac{5}{4}(2)$

$\boxed{I = \frac{5}{2}}$

13) If y varies jointly as a and b and inversely as the square root of c, and y = 12 when a = 3, b = 2, and c = 64, find y when a = 5, b = 2, and c = 25.

$y = \frac{k \cdot ab}{\sqrt{c}}$

$12 = \frac{k \cdot 3 \cdot 2}{\sqrt{64}}$

$12 = \frac{6k}{8}$

$96 = 6k$

$16 = k$

$y = \frac{16 \cdot 5 \cdot 2}{\sqrt{25}}$

$y = \frac{160}{5}$

$\boxed{y = 32}$

14) The number of minutes needed to solve an exercise set of variation problems varies directly as the number of problems and inversely as the number of people working on the solutions. It takes 4 people 36 minutes to solve 18 problems. How many minutes will it take 6 people to solve 42 problems?

$S = \frac{k \cdot n}{p}$

$36 = \frac{k \cdot 18}{4}$

$8 = k$

$S = \frac{8 \cdot 42}{6}$

$S = 56$ min.

RULES AND PROPERTIES OF WORK: If two entities are working on the same job, and the first would take *a* hou[rs to] complete the job alone and the second *b* hours to complete the job alone, then the equations $\frac{1}{a} + \frac{1}{b} = \frac{1}{t}$, can be [used] to find *t*, the time it will take to complete the job together.

1) Kelly can clean his house in *h* hours. His kids can clean the house in 5 hours more than him. If they join forc[es, they] can clean the whole house in 6 total hours. How long does it take each of them to do it separately?

$\left(\frac{1}{h} + \frac{1}{h+5} = \frac{1}{6}\right)h(h+5)(6)$

$6(h+5) + 6h = h(h+5)$

$0 = h^2 - 7h - 30$

$0 = (h-10)(h+3)$

2) FINDING THE DERIVATIVE. In Calculus the definition of a derivative is $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$.

Let $f(x) = 2x^2 - 5x$

a) Plug f(x) and f(x+h) into the derivative formula and simplify. 3 points.

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

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

$\frac{2(x^2 + 2xh + h^2) - 5h - 2x^2}{h}$

$= \frac{\cancel{2x^2} + 4xh + 2h^2 - 5h - \cancel{2x^2}}{h}$

$= \frac{4xh - 5h + 2h^2}{h}$