Name:_____ Date:_____

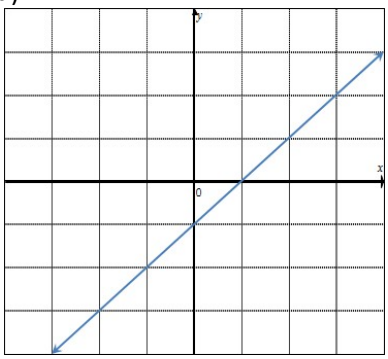
**Math 10/11 Enriched: Section 2.7 Reciprocal of Quadratic Functions**

1. Given the equation for $y = f(x)$, find the equation for $y = \dfrac{1}{f(x)}$

| | | | |
|---|---|---|---|
| a) $y = 3x - 5$ | b) $y = \dfrac{2x-1}{3}$ | c) $y = \dfrac{3x-5}{5x-1}$ | d) $y = 3x^2 + 4$ |
| e) $y = 3$ | f) $x = -5$ | g) $y = -5x^2 - 6$ | h) $y = 5x^3 - 7x^2 + 22 - 6x$ |

2. Graph the reciprocal of each function: Indicate the equations of the asymptotes, coordinate of the invariant points, domain and range of the reciprocal function.

a)



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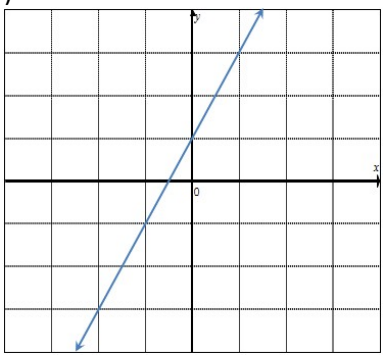

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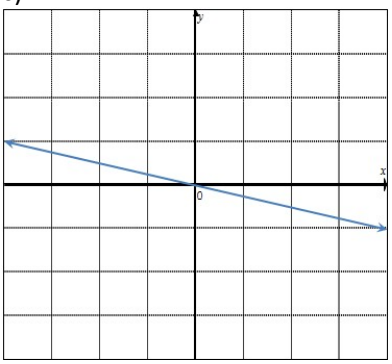

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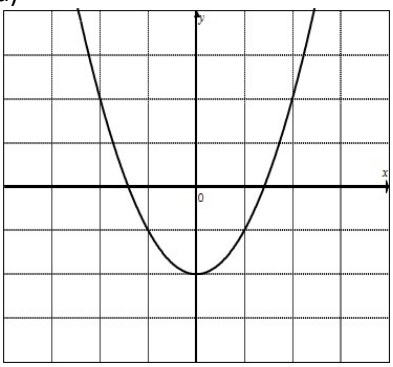

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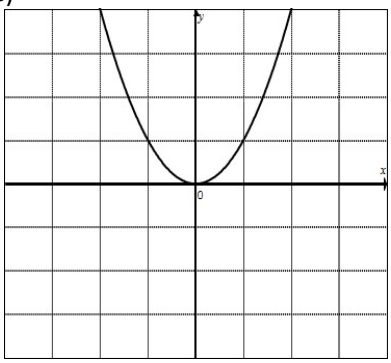

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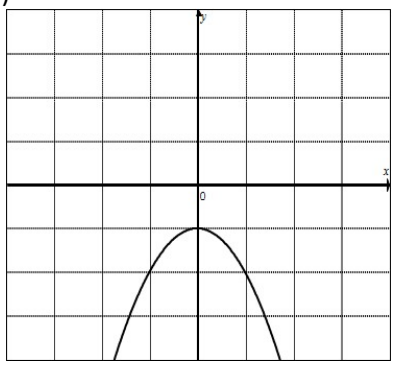

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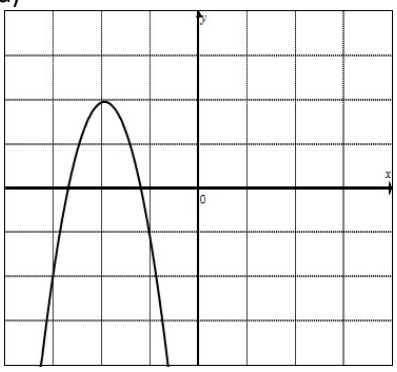

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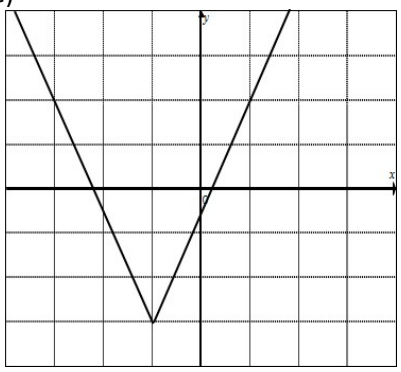

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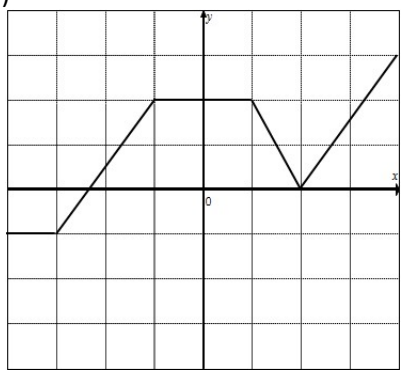
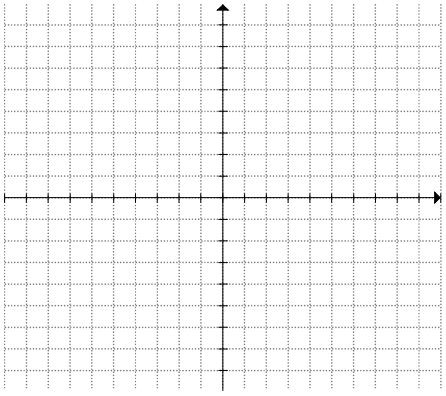


3. Indicate the coordinates of the invariant points , the equations of the vertical asymptotes, and the domain and range for each of the following functions below:

| | | |
|---|---|---|
| a) $y=\frac{1}{x}$ | b) $y=\frac{1}{3x-5}$ | c) $y=\frac{1}{-\frac{5}{2}x-11}$ |
| d) $y=\frac{1}{5x^2+6}$ | e) $y=\frac{1}{-(x-3)^2+4}$ | f) $y=\frac{1}{-3x^2-1}$ |
| g) $y=\frac{1}{-2(x-7)^2+16}$ | h) $y=\frac{1}{-1+\sqrt{3x-5}}$ | i) $y=\frac{2}{(x-3)(x+4)}$ |

4. Graph the each of the following reciprocal functions. Indicate the asymptotes, coordinates of the invariant points, domain and range:

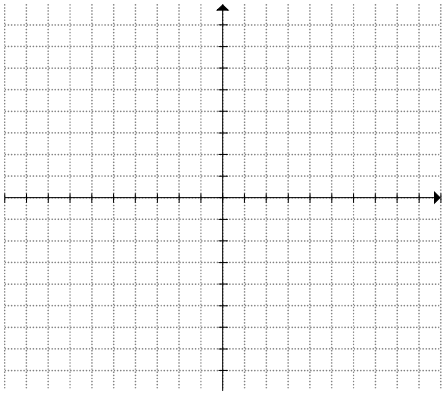
a) $y=\dfrac{1}{x-6}$



Invariant Pts: Asymptotes:

Domain: Range:

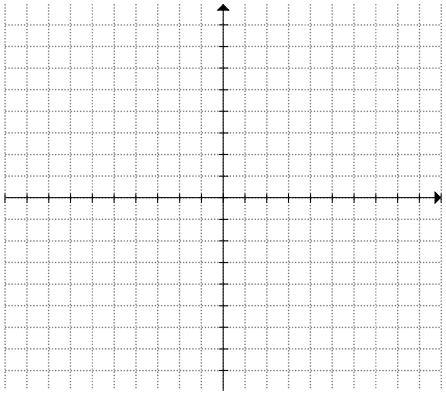
b) $y=-\dfrac{1}{2x+4}$



Invariant Pts: Asymptotes:

Domain: Range:

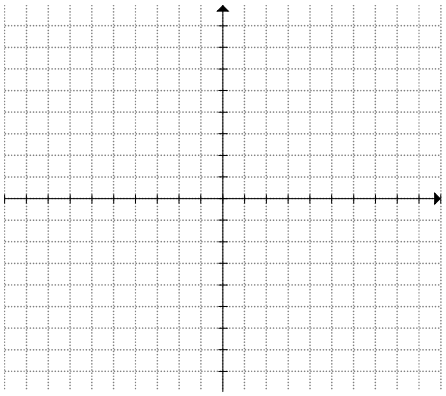
b) $y=\dfrac{1}{(x-1)^2}$



Invariant Pts: Asymptotes:

Domain: Range:

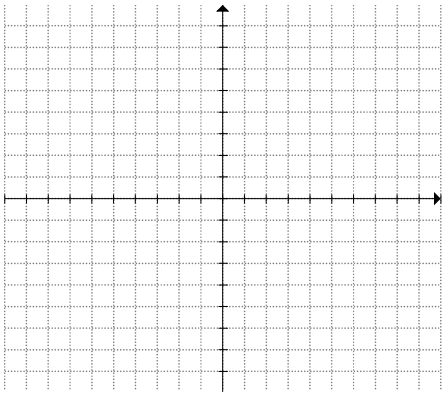
a) $y=\dfrac{1}{x^2-3}$



Invariant Pts: Asymptotes:

Domain: Range:

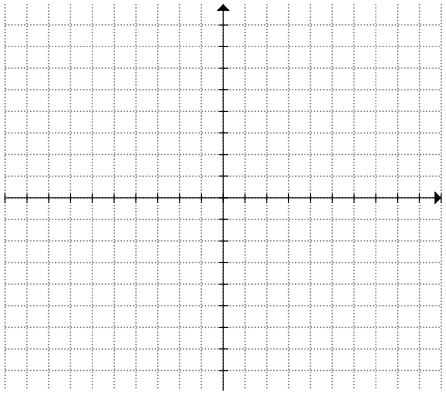
b) $y=-\dfrac{1}{2x^2+1}$



Invariant Pts: Asymptotes:

Domain: Range:

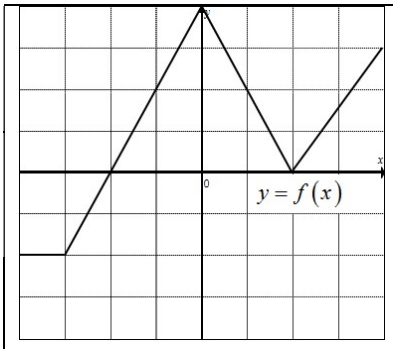
b) $y=\dfrac{1}{x^2-25}$



Invariant Pts: Asymptotes:

Domain: Range:

5. Given the graph of $y=f(x)$, and $g(x)=\dfrac{1}{f(x)}$ find the following values:




| | | |
|---|---|---|
| a) $g(0)$ | b) $g(2)$ | c) $g(1)$ |
| d) $g(k)=1$ | e) $g(-3)$ | f) $g(1)f(1)$ |
| g) $g(4)\times f(4)$ | h) $g(4)\div f(4)$ | i) $g(-2)\times f(-2)$ |

6. Given the function $y = \dfrac{1}{(x-3)^2 + k}$, for what values of "k" will the graph not have any invariant points?

7. Given the function $y = \dfrac{-1}{(x-2)^2 + k}$, for what values of "k" will the graph have four invariant points?

8. Given the function $y = \dfrac{-1}{(x+2)^2 + 4 - k}$, for what values of "k" will the graph not have any vertical aymptotes?

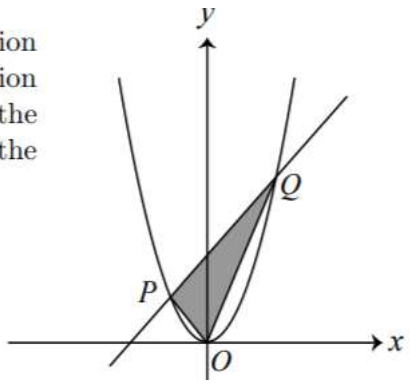
9. If the range of $y = f(x)$ is $-0.5 < y \le 3$, what is the range of $y = \dfrac{1}{f(x)}$? Justify your answer

10. If the range of $y = f(x)$ is $-5 < y \le 4$, what is the range of $y = \dfrac{1}{f(x)}$? Justify your answer

Suppose that $k > 0$ and that the line with equation $y = 3kx + 4k^2$ intersects the parabola with equation $y = x^2$ at points $P$ and $Q$, as shown. If $O$ is the origin and the area of $\triangle OPQ$ is 80, then the slope of the line is

**(A)** 4 **(B)** 3 **(C)** $\frac{15}{4}$

**(D)** 6 **(E)** $\frac{21}{4}$




Consider the quadratic equation $x^2 - (r+7)x + r + 87 = 0$ where $r$ is a real number. This equation has two distinct real solutions $x$ which are both negative exactly when $p < r < q$, for some real numbers $p$ and $q$. The value of $p^2 + q^2$ is

**(A)** 7618 **(B)** 698 **(C)** 1738 **(D)** 7508 **(E)** 8098

Rectangular prism $PQRSWTUV$ has a square base $PQRS$. Point $X$ is on the face $TUVW$ so that $PX = 12$, $QX = 10$ and $RX = 8$. The maximum possible area of rectangle $PQUT$ is closest to

**(A)** 67.84 **(B)** 67.82 **(C)** 67.90

**(D)** 67.86 **(E)** 67.88