

Name _____

Accelerated Geometry/Adv Alg

Date _____ Period _____

13.4 Writing Rational Functions

Write a rational function given the following characteristics.

- 1) Zeros at -1 and 3 and a vertical asymptote at $x = 0$

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

- 2) Zero at 2, vertical asymptotes at $x = -2$ and $x = 0$, and a horizontal asymptote at $y = 0$

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

- 3) Zero at 2, vertical asymptote at $x = -1$, horizontal asymptote at $y = 1$, and a hole at $x = -3$

$$\frac{(x-2)(x+3)}{(x+1)(x+3)} \quad f(x) = \frac{x^2 + x - 6}{x^2 + 4x + 3}$$

- 4) No zeros, no vertical asymptotes, and a horizontal asymptote at $y = 1$

$$f(x) = \frac{x^2 + 3}{x^2 + 5} \quad (\text{poss. ans.})$$

- 5) Zero at 0, vertical asymptotes at $x = -3$ and $x = 3$, and holes at $x = -1$ and $x = 1$

$$\frac{x(x+1)(x-1)}{(x+3)(x-3)(x+1)(x-1)} = \frac{x(x^2-1)}{(x^2-9)(x^2-1)} = f(x) = \frac{x^3 - x}{x^4 - 10x^2 + 9}$$

- 6) Hole at $2/3$, vertical asymptotes at $x = -7/2$, zero at $x = 6/7$, at horizontal asymptote at $y = 7/2$

$$\frac{(3x-2)(7x-6)}{(3x-2)(2x+7)} \quad f(x) = \frac{21x^2 - 32x + 12}{6x^2 + 17x - 14}$$

Rewrite the following functions into transformational form and list the transformations.

$$7) f(x) = \frac{4x-5}{x+7}$$

$$x+7 \overline{) \begin{array}{r} 4 \\ 4x-5 \\ -4x+28 \\ \hline -33 \end{array}}$$

$$f(x) = \frac{-33}{x+7} + 4$$

- refl. x-axis
- v stretch by 33
- shift left 7
- shift up 4

$$8) f(x) = \frac{2x^2-5x+2}{x^2+3x-10}$$

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

$$\frac{(x-2)(2x-1)}{(x+5)(x-2)}$$

$$x+5 \overline{) \begin{array}{r} 2 \\ 2x-1 \\ -2x+10 \\ \hline -11 \end{array}}$$

$$f(x) = \frac{-11}{x+5} + 2$$

- refl x-axis
- v stretch by 11
- shift left 5
- shift up 2

$$9) f(x) = \frac{x^2+10x+21}{x^2-2x-63}$$

$$\frac{(x+7)(x+3)}{(x-7)(x-9)}$$

$$x-9 \overline{) \begin{array}{r} 1 \\ x+3 \\ -x+9 \\ \hline 12 \end{array}}$$

$$f(x) = \frac{12}{x-9} + 1$$

- v stretch by 12
- shift right 9
- shift up 1

$$10) f(x) = \frac{2x}{x-7}$$

$$x-7 \overline{) \begin{array}{r} 2 \\ 2x \\ -2x+14 \\ \hline 14 \end{array}}$$

$$f(x) = \frac{14}{x-7} + 2$$

- v stretch by 14
- shift right 7
- shift up 2