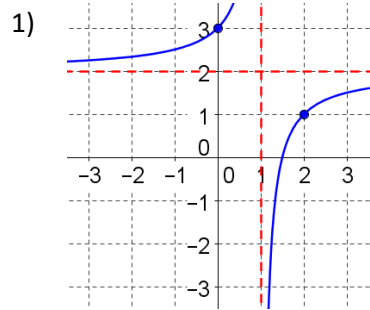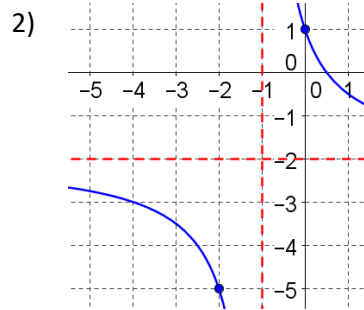# SM3: 3.4: Rational Graph Transformations

Describe how $\frac{1}{x}$ was transformed to build each function:

1)

Vertical shift up by 2, horizontal shift right by 1, vertical flip.

2)

Vertical shift down by 2, horizontal shift left by 1, vertical stretch with factor of 3.
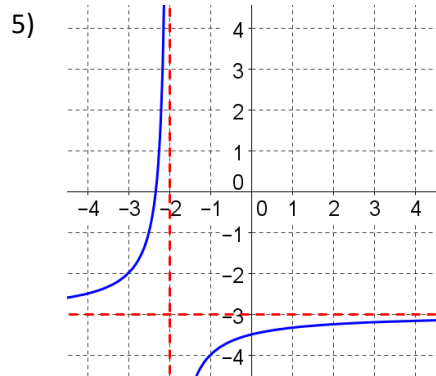
3) $y = \dfrac{53}{x + 75}$

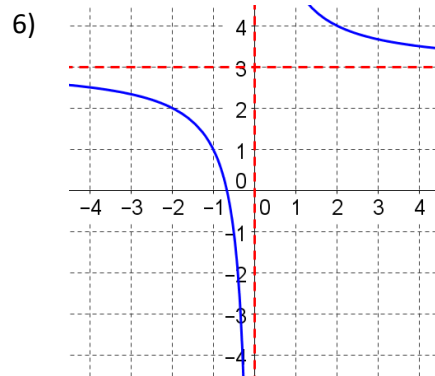Horizontal shift left by 75, vertical stretch with factor of 53.

4) $y = -\dfrac{7}{x} - 2000$

Vertical shift down by 2000, vertical stretch with factor of 7, vertical flip.
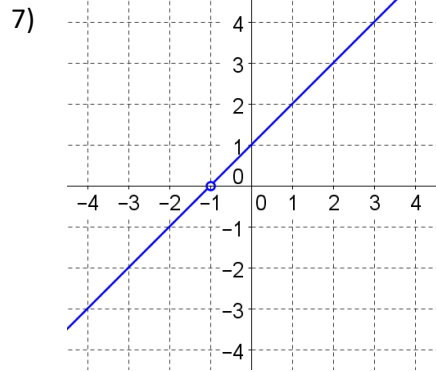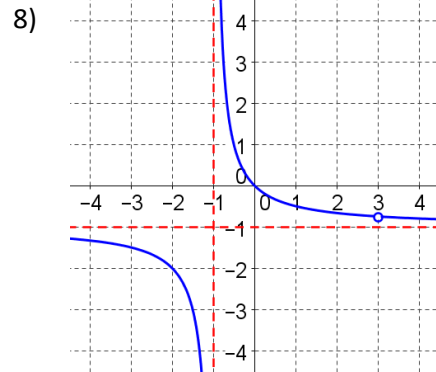
Sketch the function with the given transformations.

5)

$p(x)$ is $\frac{1}{x}$ but shifted to the left by 2, shifted down by 3, and vertically flipped.

6)

$q(x)$ is $\frac{1}{x}$ but shifted up by 3, and vertically stretched by a factor of 2.

7)

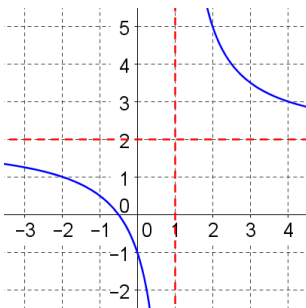$$r(x) = \frac{x^2 - 1}{x + 1} + 2$$

8)

$$r(x) = \frac{x - 3}{x^2 - 2x - 3} - 1$$

Simplify and sketch the function. Describe the asymptotic behavior of the function using limit notation:

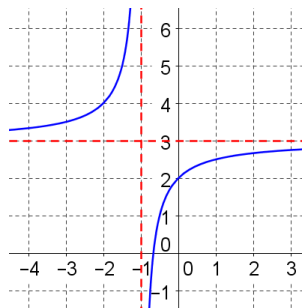9) $$f(x) = \frac{2x + 1}{x - 1}$$

$$\lim_{x \to 1^-} f(x) = -\infty$$
$$\lim_{x \to 1^+} f(x) = \infty$$

10) $$g(x) = \frac{3x + 2}{x + 1}$$

$$\lim_{x \to -1^-} g(x) = \infty$$
$$\lim_{x \to -1^+} g(x) = -\infty$$

11) $$h(x) = \frac{2x + 5}{3x - 3}$$
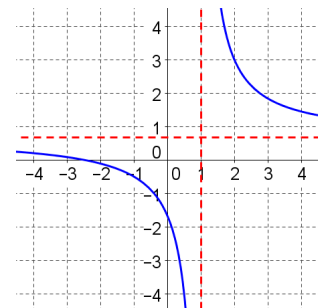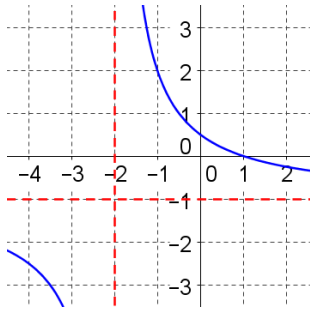

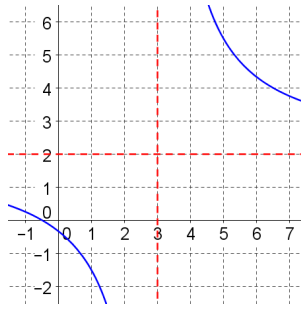$$\lim_{x \to 1^-} h(x) = -\infty$$
$$\lim_{x \to 1^+} h(x) = \infty$$

Simplify and sketch the function. State the increasing interval(s) and decreasing interval(s) of each function:
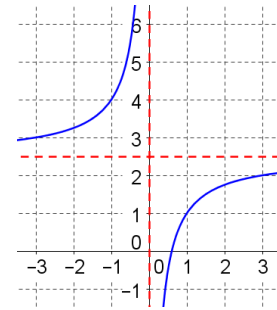
12) $j(x) = \dfrac{-x+1}{x+2}$

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

14) $m(x) = \dfrac{5x-3}{2x}$

INC: $\emptyset$

DEC: $(-\infty, -2) \cup (-2, \infty)$

INC: $\emptyset$

DEC: $(-\infty, 3) \cup (3, \infty)$

INC: $(-\infty, 0) \cup (0, \infty)$

DEC: $\emptyset$