

3.3 Rational Functions of the Form $f(x) = \frac{ax + b}{cx + d}$

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1. For each function,
- determine the equations of the asymptotes
 - state the domain and range
 - sketch the graph
 - summarize the increasing and decreasing intervals

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

b) $g(x) = \frac{4x}{2-x}$

c) $h(x) = \frac{2x+3}{4-3x}$

2. a) State the equations of the vertical and horizontal asymptotes of

$$f(x) = \frac{ax+b}{cx+d}.$$

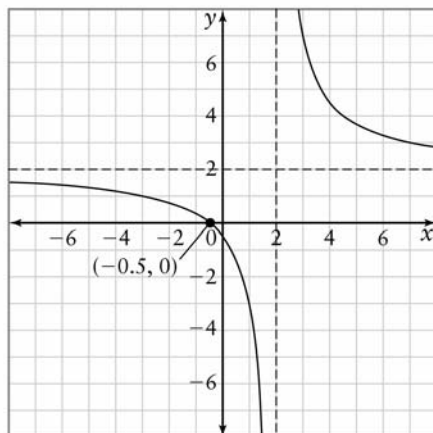
- b) State the domain and range of

$$f(x) = \frac{ax+b}{cx+d}.$$

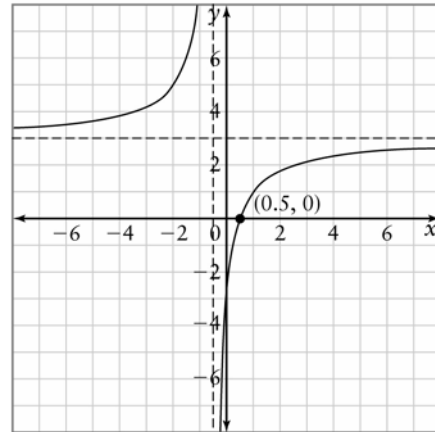
3. Determine an equation in the form

$$f(x) = \frac{ax+b}{cx+d} \text{ for the function shown in each graph.}$$

- a)



- b)



4. Determine an equation of the form

$$f(x) = \frac{ax+b}{cx+d} \text{ for a rational function}$$

whose graph has the indicated features.

- vertical asymptote $x = 3$, horizontal asymptote $y = -2$, and passing through the point $(2, 1)$
- vertical asymptote $x = 4$, horizontal asymptote $y = 3$, and x -intercept of 3

5. The cost of an appliance whose purchase price is \$600 and annual hydro cost is \$115 is given by the function

$$C(n) = \frac{600 + 115n}{n}, \text{ where } C \text{ is the}$$

annual cost, in dollars, and n is the number of years.

- Sketch a graph of C versus n .
- As n becomes very large, what happens to C ?
- Determine the number of years needed to reduce the annual cost to below \$200.

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6. Consider the rational function

$$f(x) = 3\left(\frac{1}{x-2}\right) + 4.$$

- a) Use transformations to compare the graph of the function to the graph of

$$y = \frac{1}{x}.$$

- b) Rewrite the equation for f in the form

$$f(x) = \frac{ax+b}{cx+d}.$$

- c) How are the values of a , b , c , and d related to the numbers in the original equation for f ?

7. Repeat question 6 for the function

$$f(x) = k\left(\frac{1}{x-p}\right) + q.$$

8. **Use Technology** The concentration of a drug in the bloodstream is given by the

equation $C(t) = \frac{5t}{0.01t^2 + 3.3}$, where t is

the time, in minutes, and C is the concentration, in micrograms per millilitre.

- a) Graph the function using technology.
b) Determine the maximum concentration and when it will occur.
c) Determine the effect of changing the values of the coefficients in the equation.