

1. (5 points) Let f be an increasing function defined for $x \geq 0$. The table gives values of $f(x)$ at selected values of x .

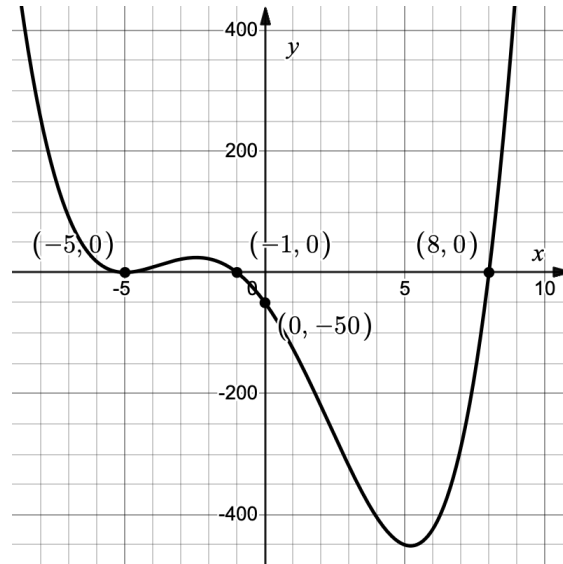
x	1	2	3	4	5
$f(x)$	-4	6	10	23	40

The function g is given by

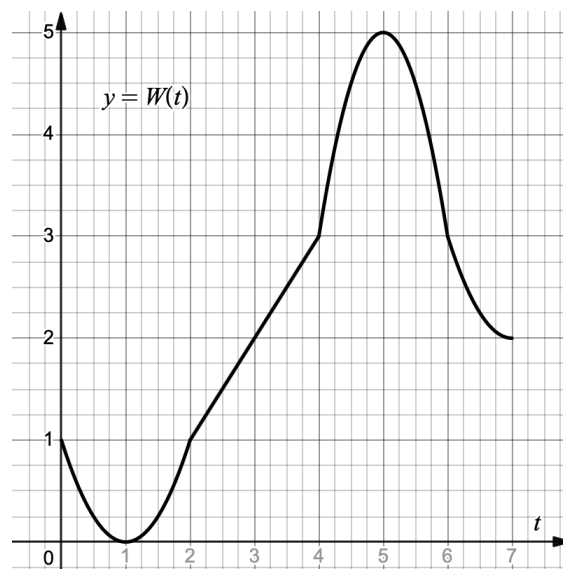
$$g(x) = \frac{x^3 - 7}{x + 2}.$$

- (a) The function h is defined by $h(x) = g(f(x))$. Find the value of $h(2)$ as a decimal approximation, or indicate that it is not defined.
- (b) Find the value of $f^{-1}(-4)$, or indicate that it is not defined.

2. (6 points) Find a possible formula for the polynomial function shown below.



3. (4 points) The graph of $y = W(t)$ is shown for $0 \leq t \leq 7$. What are all intervals of t on which the function is both increasing and concave up? If none, write DNE.



4. (10 points) Let $k(x)$ be the function given by

$$k(x) = \frac{x^2 - 2x - 35}{x^3 - 3x^2 - 18x}.$$

(a) Find the zeros of $k(x)$.

(b) Find all vertical asymptotes.

(c) What is the domain of $k(x)$?

(d) Find a horizontal asymptote and describe the long-run behavior of the function $k(x)$ as $x \rightarrow +\infty$ and $x \rightarrow -\infty$.

5. (12 points) A theater manager graphed weekly profits as a function of the number of patrons and found that the relationship was linear. One week the profit was \$9500 when 1300 patrons attended. Another week 1500 patrons produced a profit of \$11,400.

(a) Find a formula for weekly profit, y , as a function of the number of patrons, x .

(b) Interpret the slope and the y -intercept.

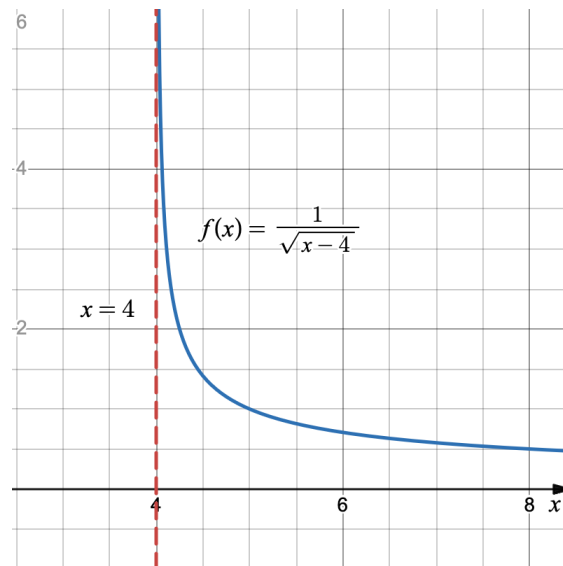
(c) If the weekly profit was \$20,900, how many patrons attended the theater?

(d) Find a formula for the number of patrons as a function of profit.

6. (4 points) Find the domain of the function

$$f(x) = \frac{1}{\sqrt{x-4}}$$

by examining its formula and/or its graph.



7. (8 points) Let

$$f(x) = \frac{5x-2}{1-3x}$$

For what value of x is $f(x) = 2$?

8. (9 points) A water fountain shoots a stream of water from ground level into the air forming a parabolic arc. The height $H(t)$, in feet, of the water stream at time t , in seconds, is modeled by the equation

$$H(t) = -16t^2 + 48t$$

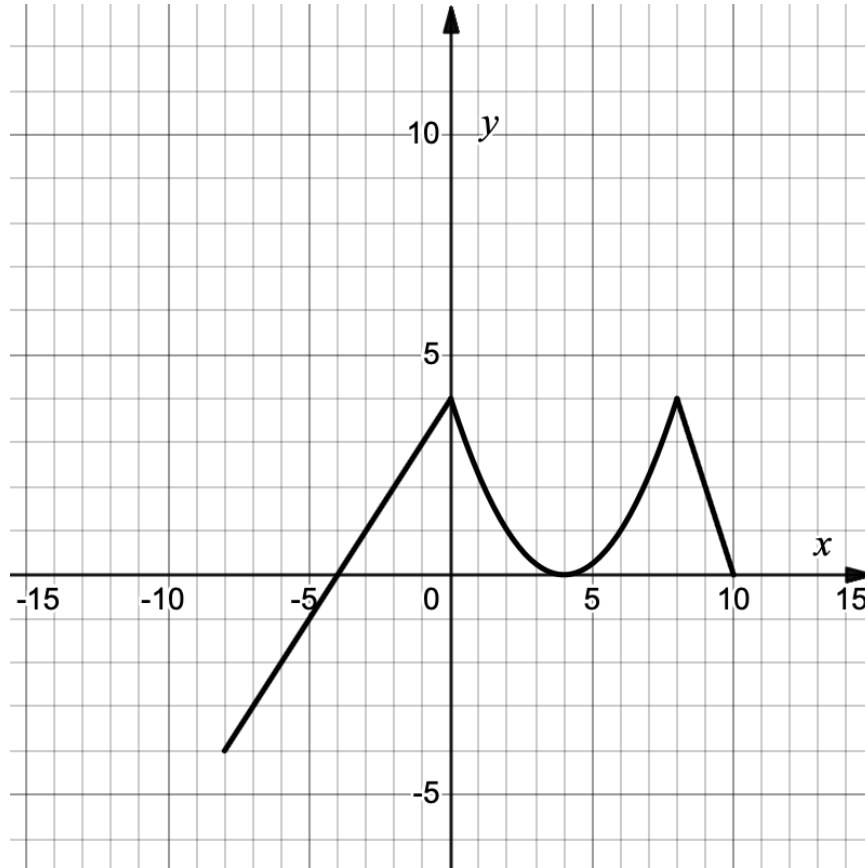
(a) Find the time it takes for the water to reach its maximum height.

(b) What is the maximum height of the water?

(c) Find the time it takes for the water stream to come back to ground level.

9. (6 points) The graph of the function $f(x)$ is given below. Graph the following transformation of the function $f(x)$ on the same axes.

$$y = -f(x + 2) + 4$$



10. (6 points) The point $(2, -3)$ is on the graph of $y = p(x)$. Give the coordinates of the corresponding point on the graph of the transformation

$$q(x) = -3 \cdot p(2x) + 1.$$

11. (9 points) At the Fun Slice Pizzeria it costs 2 cents per square inch to add pepperoni to a pizza.

(a) Find a formula for the cost $C(A)$ to cover A square inches of a pizza.

(b) The area of a circular pizza (in square inches) is a function of the radius r (in inches) is given by

$$A(r) = \pi r^2.$$

Find an expression for $C(A(r))$ and explain what it means in practical terms.

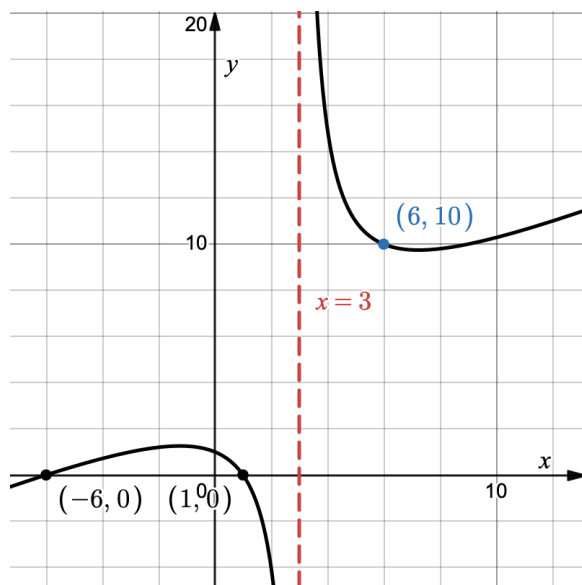
(c) Find the cost in dollars of completely covering a circular pizza of radius 8 inches. Round your answer to the nearest penny.

12. (6 points) In a microwave oven, cooking time t is inversely proportional to the square root of the amount of power used w . It takes 8 minutes to heat a frozen dinner at 625 watts.

(a) Write a formula for the cooking time, t , as a function of power level, w .

(b) Find the cooking time needed to heat the frozen dinner at the power level $w = 324$ watts.

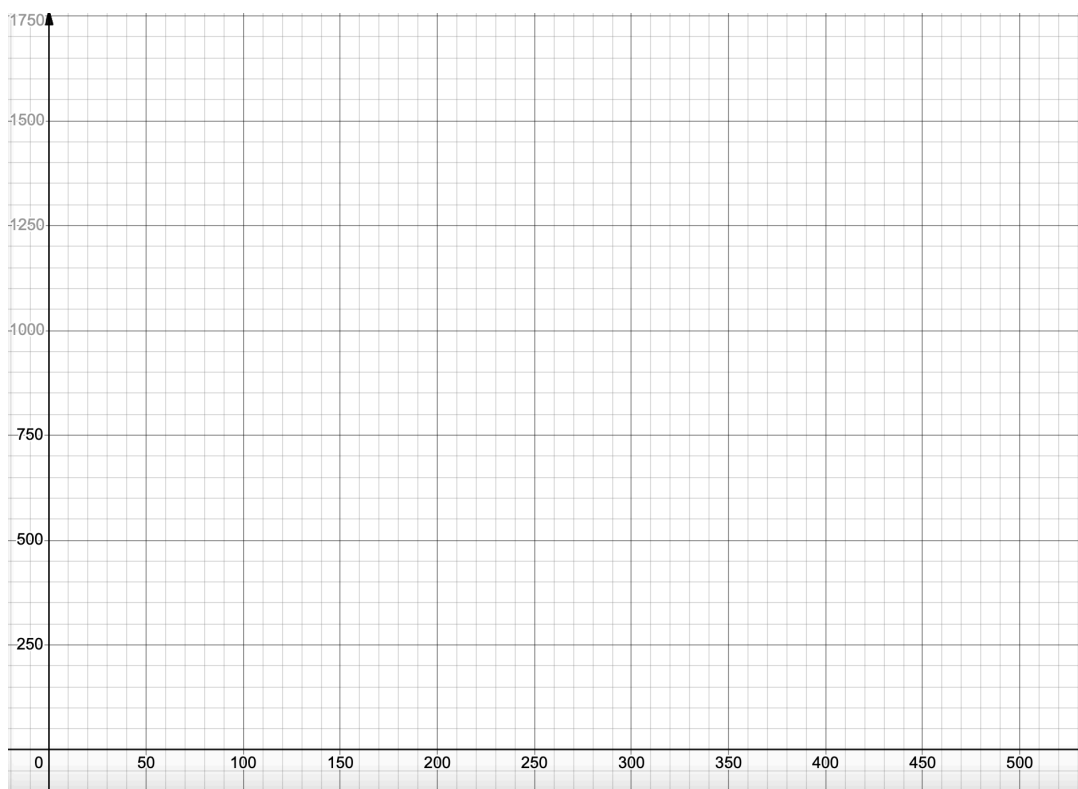
13. (6 points) The function f is a rational function. Its graph is shown below. Give a possible formula for $f(x)$.



14. (9 points) A floor-refinishing company charges \$2.5 per square foot to strip and refinish a tile floor for up to 500 square feet. Since the tiles generate toxic waste, there is an additional charge of \$350 for toxic waste disposal for any job that includes more than 200 square feet of tile.

(a) Express the cost, y , of refinishing a floor as a piecewise-defined function of the number of square feet, x , to be refinished.

(b) Graph the function.



(c) Give the domain and range.

Formulas

Average rate of change: $\frac{f(b) - f(a)}{b - a}$

Slope-intercept form: $y = b + mx$

Point-slope form: $y - y_0 = m(x - x_0)$

Standard form: $Ax + By = C$

Quadratic function: $y = ax^2 + bx + c$

Factored form: $y = a(x - r)(x - s)$

Quadratic formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Vertex form: $y = a(x - h)^2 + k$

Power function $y = kx^p$

Directly proportional: $y = kx$

Inversely proportional: $y = \frac{k}{x}$

Factored form of a polynomial: $p(x) = c(x - a_1)(x - a_2) \cdots (x - a_n)$