Combining	Inverses	Quadratic	Polynomial	Grab Bag
100	100	100	100	100
200	200	200	200	200
300	300	300	300	300
400	400	400	400	400
500	500	500	500	500

Let $f(x) = x^2 - 2$ and $g(x) = x + 5$. Find $(f + g)(x)$.

$$(f + g)(x) = x^2 + x + 3$$

Let $f(x) = \frac{1}{\sqrt{2x-5}}$ and $g(x) = x^2 + 3$. Find $(g \circ f)(x)$.

$$(g \circ f)(x) = \frac{6x+16}{2x+5}$$

The volume $V(r)$ in cubic meters of a spherical ballon with radius r meters is given by $V(r) = \frac{4}{3}\pi r^3$. The radius $W(t)$ after t seconds is given by $W(t) = 4t + 2$. Write a formula for the volume of the balloon, $M(t)$, after t, seconds.

$$\frac{4}{3}\pi(4t+3)^3$$

Suppose $H(x) = \sqrt[3]{3x + 6}$ and $H(x) = (f \circ g)(x)$. If $f(x) = \sqrt[3]{3x}$, what is $g(x)$?

$$g(x) = x + 2$$

Let $f(x) = 2x + 5$ and $g(x) = \sqrt{x + 3}$. What is the domain of $\left(\frac{g}{f}\right)(x)$?

$$[-3, -\tfrac{5}{2}) \cup (-\tfrac{5}{2}, \infty)$$

Let $f(x) = \sqrt{3-x} + 8$. What is $f^{-1}(x)$?

$$f^{-1}(x) = -(x - 8)^2 + 3$$

Let $f(x) = \frac{x-8}{x-7}$. Find $f^{-1}(x)$.

$$f^{-1}(x) = \frac{7x-8}{x-1}$$

Trey decided to go for a run. His distance, D, in kilometers from Newbury Heights after t hours of running is given by $D(t) = 13.5 - 5t$. In practical terms, what does $D^{-1}(10) = 0.7$ represent?

When Trey is 10 kilometers from home he has been running for 0.7 hours (42 minutes).

Let $f(x) = \sqrt{2x - 10}$. Find the domain and range of $f^{-1}(x)$.

Domain: $[0, \infty)$
Range: $[5, \infty)$

Let $f(x) = \frac{-x-4}{x+12}$. Find the domain and range of $f^{-1}(x)$.

Domain: $(-\infty, -1) \cup (-1, \infty)$
Range: $(-\infty, -12) \cup (-12, \infty)$
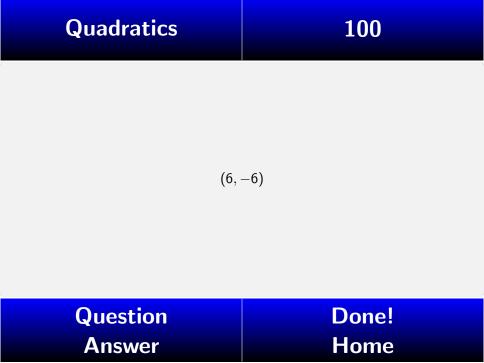
Find the vertex of $f(x) = x^2 - 12x + 30$.

$(6, -6)$
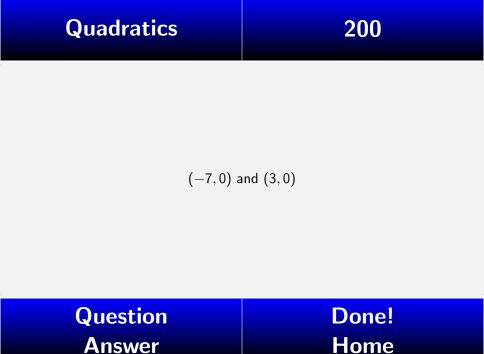
Find the zeros of $2x^2 + 8x - 42$.

$(-7, 0)$ and $(3, 0)$

Write an equation for a quadratic function that passes through the points $(-2, 0)$, $(-5, 0)$ and $(-3, 5)$.
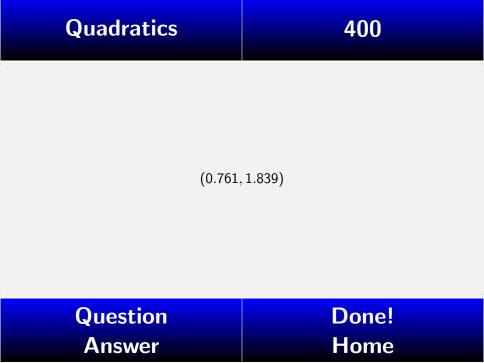
$$f(x) = -\tfrac{5}{2}(x + 2)(x + 5)$$

A ball is thrown into the air and its height can be modeled by the function $h = 3 + 13t - 5t^2$
When is the ball above 10 feet?

$(0.761, 1.839)$

The manager of an 80-unit apartment complex is trying to decide what rent to charge each month. At a rent of $800, all 80 units are full. On average, one additional unit will become vacant for each $25 increase in rent.

Write an equation that represents the revenue with respect to x where x is the price charged for rent.
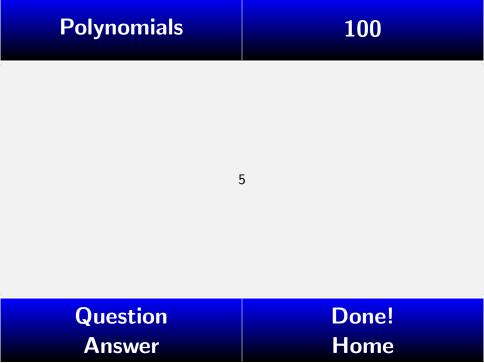
$$R(x) = (-\tfrac{1}{25}x + 112)(x)$$

What is the degree of $f(x) = -x + 7x^5 - 15x^2 - 7x^4$?

5

Describe the end behavior of $f(x) = -x + 7x^6 - 15x^2 - 7x^4$.

$f(x) \to +\infty$ as $x \to -\infty$
$f(x) \to +\infty$ as $x \to +\infty$

Find all the intercepts of $f(x) = \frac{1}{30}(x^4 + 4x^3 - 27x^2 - 70x + 200)$.

y-intercept $(0, 6.667)$
x-intercepts $(-5, 0)$ $(2, 0)$ $(4, 0)$

According to their website, American Airlines limits the size of checked baggage in such a way that the length+width+height of the bag can be no more than 45 inches. Suppose a piece of luggage has length and width equal to x inches. Find the maximum volume for such a piece of luggage.

$1,687.5$ cubic inches

The function $f(x) = 0.37x^3 - 2.52x^2 + 17.83x - 10.21$ approximates the number of followers a person has after the first 20 days of creating their Twitter account. Assume the value of x represents the start of the 20th day.

During the middle of which day would a person have 100 followers?

During the middle of the 26th day.

A concert venue has determined when tickets are priced at $50, a total of 600 tickets will be sold. For every $1 increase in price, 10 fewer tickets will be sold. Let x represent the number of times the price is increased. Determine a formula for the price, p, quantity, q, and revenue, R, all in terms of x.

(a) $p(x) = 50 + 10x$, $q(x) = 600 - x$, $R(x) = (50 + 10x)(600 - x)$

(b) $p(x) = 50 - 10x$, $q(x) = 600 + x$, $R(x) = (50 - 10x)(600 + x)$

(c) $p(x) = 50 + x$, $q(x) = 600 + 10x$, $R(x) = (50 + x)(600 + 10x)$

(d) $p(x) = 50x$, $q(x) = 6000x$, $R(x) = (50x)(6000x)$

(e) $p(x) = 50 + x$, $q(x) = 600 - 10x$, $R(x) = (50 + x)(600 - 10x)$

(e) $p(x) = 50 + x$, $q(x) = 600 - 10x$, $R(x) = (50 + x)(600 - 10x)$

Suppose the function $C = f(x)$ represents the cost, in dollars, for a company to manufacture x thousand batteries. Which of the following statements is the correct interpretation of $f^{-1}(400) = 600$?

(a) To manufacture 400 batteries, the cost is \$600

(b) At a cost of \$400, the company can manufacture 600 batteries

(c) At a cost of \$400, the company can manufacture 600,000 batteries.

(d) To manufacture 400,000 batteries, the cost is \$600.

(*c*) At a cost of $400, the company can manufacture 600,000 batteries.

Determine a formula for the parabola that has its vertex at $(4, -5)$ and passes through the point $(6, 3)$.

(a) $y = (x + 4)^2 - 5$

(b) $y = -2(x - 6)^2 + 3$

(c) $y = (x - 4)^2 - 5$

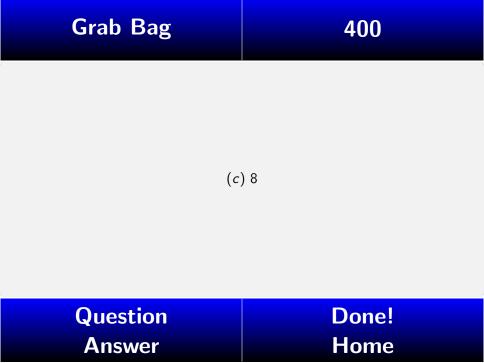(d) $y = 2(x - 4)^2 - 5$

(e) $y = x - 6)^2 + 3$

$(d)\ y = 2(x-4)^2 - 5$

Determine the degree of the polynomial function
$$f(x) = 2(x + 4)^3(x + 1)^2(x^2 + 3)(x - 5).$$

(a) 4

(b) 3

(c) 8

(d) 7

(e) None of these

(c) 8

The revenue and cost functions for a particular product are given by $R(x) = -0.01x^2 + 60x$ and $C(x) = 0.0009x^3 + 10x + 2000$, where x is the number of units produced and sold. Find a function to represent the profit as a function of x, and determine the number of units that should be produced and sold in order to maximize profit.

The number of units that should be produced and sold is:

(a) Less than 120

(b) Between 120 and 130

(c) Between 130 and 140

(d) Between 140 and 150

(e) More than 150

(c) Between 130 and 140