Period 4, Oct 31, 2024

Solve the quadratic equation by completing the square.

$x^2 + 6x = -8$ $\Rightarrow x^2 + 6x + 9 = -8 + 9$

$a = 1$

$b = 6$

$\frac{b}{2} = \frac{6}{2} = 3$

$\left(\frac{b}{2}\right)^2 = \left(\frac{6}{2}\right)^2 = (3)^2 = 9$

$\sqrt{(x+3)^2} = \sqrt{1}$

$(x+3) = \pm 1$

$x + 3 = \pm 1$

$-3 \quad -3$

$x = -3 \pm 1$

$x = -3 - 1$ or $x = -3 + 1$

$x = -4$ ✓ or $x = -2$ ✓

Plug in

$(-2)^2 + 6(-2)$

$4 - 12 = -8$

$(-4)^2 + 6(-4)$

$16 - 24$

-8

Standard Form $a + bi$

The division $\frac{8+8i}{7-3i}$ i

$$\frac{(8+8i)(7+3i)}{(7-3i)(7+3i)}$$

$$\frac{56 + 24i + 56i + 24i^2}{49 + \cancel{21i} - \cancel{21i} - 9i^2}$$

$$\frac{56 + 80i + 24(-1)}{49 - 9(-1)} = \frac{56 + 80i - 24}{49 + 9}$$

$$\frac{32 + 80i}{58} = \frac{32}{58} + \frac{80}{58}i = \frac{16 \cdot \cancel{2}}{29 \cdot \cancel{2}} + \frac{40 \cdot \cancel{2}}{29 \cdot \cancel{2}}i = \frac{16}{29} + \frac{40}{29}i$$

$i = \sqrt{-1}$

$i^2 = -1$

$i^3 = i^2 \cdot i = -1 \cdot i = -i$

$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$

$i^5 = i^4 \cdot i = 1 \cdot i = i$

$i^6 = -1$

$i^7 = -i$

$i^8 = 1$

$7-(-3+3i)-(-3-i)$

$7+3-3i+3+i$

$13-2i$

$(7-2i)(-8-4i)$

$-56-28i+16i+8i^2$

$-56-12i+8(-1)$

$-56-12i-8$

$-64-12i$

$(4+7i)^3$

$(4+7i)(4+7i)(4+7i)$

$(16+28i+28i+49i^2)(4+7i)$

$(16+56i+49(-1))(4+7i)$

$(-33+56i)(4+7i)$

$-132-231i+224i+392i^2$

$-132-7i+392(-1)=-132-7i-392=-524-7i$

Divide and express the result in standard form.

$$\frac{5\,(8+i)}{(8-i)(8+i)} = \frac{40+5i}{64 \cancel{-8i} \cancel{+8i} - i^2} = \frac{40+5i}{64-(-1)} = \frac{40+5i}{65} = \frac{40}{65} + \frac{5i}{65} = \frac{8}{13} + \frac{1}{13}i$$

$$\sqrt{-9} - \sqrt{-36} = 3i - 6i = -3i$$

$$\frac{-20+\sqrt{-50}}{60} = \frac{-20+5i\sqrt{2}}{60} = \frac{-20}{60} + \frac{5i\sqrt{2}}{60}$$

$$-\frac{1}{3} + \frac{i\sqrt{2}}{12}$$

50

5 10

5 2

$$\sqrt{50} = \sqrt{5\cdot5\cdot2}$$

$$= 5\sqrt{2}$$

$$\sqrt{-50} = 5\sqrt{2}\,i$$

$$(3+i)^2 - (4-i)^2$$

$$(3+i)(3+i) - [(4-i)(4-i)]$$

$$9 + 3i + 3i + i^2 - [16 - 4i - 4i + i^2]$$

$$9 + 6i - 1 - [16 - 8i - 1]$$

$$9 + 6i \cancel{-1} - 16 + 8i \cancel{+1} = -7 + 14i$$

Evaluate $x^2 - 2x + 5$ for $x = 2 + i$.

$(2+i)^2 - 2(2+i) + 5$

$(2+i)(2+i) - 4 - 2i + 5$

$4 + 2i + 2i + i^2 - 4 - 2i + 5$

$\cancel{4} + 4i - 1 - \cancel{4} - 2i + 5 = 2i + 4$

$4\sqrt{-81} + 7\sqrt{-49}$

$4 \cdot 9i + 7 \cdot 7i = 36i + 49i = 85i$

$\sqrt{-81} = 9i$

$\sqrt{-49} = 7i$

Let P = (x,y) be a point on the graph of $y = x^2 - 6$.

Express the distance, d, from P to the origin as a function of the point's x-coordinate.

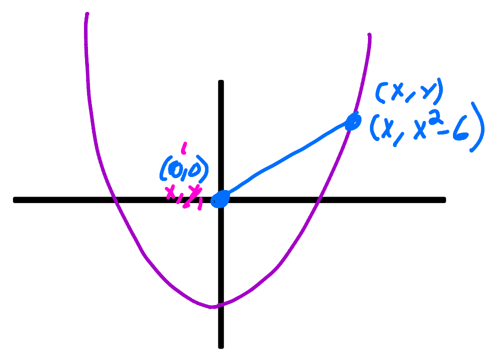
$d(x) = \boxed{\sqrt{x^4 - 11x^2 + 36}}$ (Type a simplified expression.)

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

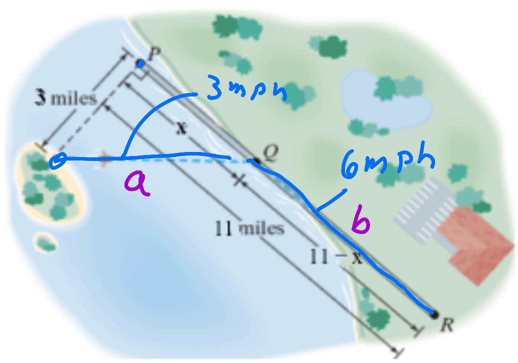
$$\sqrt{(x-0)^2 + ((x^2-6)-0)^2}$$

$$\sqrt{(x)^2 + (x^2-6)^2} = \sqrt{x^2 + x^4 - 12x^2 + 36}$$

$$\sqrt{x^4 - 11x^2 + 36}$$



You are on an island 3 miles from the nearest point P on a straight shoreline, as shown in the figure. 11 miles down the shoreline from point P is a restaurant, shown as point R. To reach the restaurant, you first row from the island to point Q, averaging 3 miles per hour. Then you jog the distance from Q to R, averaging 6 miles per hour. Express the time, T, it takes to go from the island to the restaurant as a function of the distance, x, from P, where you land the boat.



$T(x) = \boxed{\dfrac{\sqrt{x^2+9}}{3} + \dfrac{11-x}{6}}$

$a^2 = 3^2 + x^2$ $\quad b = 11 - x$

$a = \sqrt{9 + x^2} = d$

(Type an exact answer, using radicals as needed. Use integers or fractions for any numbers in the expression.)

How Long For The Run

$\dfrac{11-x}{6} = T$

$d = rT$

$\dfrac{d}{r} = T$

How long For rowboat

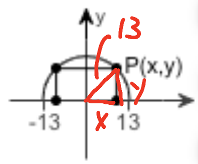
$\dfrac{\sqrt{x^2+9}}{3}$ T

Total Time $\dfrac{11-x}{6} + \dfrac{\sqrt{x^2+9}}{3}$ = Total Time

---

The figure shows a rectangle with two vertices on a semicircle of radius 13 and two vertices on the x-axis. Let P(x,y) be the vertex that lies in the first quadrant.

$y = \sqrt{169 - x^2}$



$13^2 = x^2 + y^2$

$169 = x^2 + y^2$

$169 - x^2 = y^2$

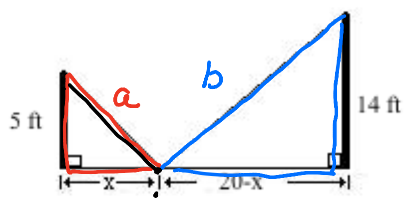
$\sqrt{169 - x^2} = y$

$Area = y \cdot 2x = (\sqrt{169 - x^2})(2x)$

a) Express the area of the rectangle, A, as a function of x.

A(x) = ☐ (Type a simplified expression.)

Two vertical poles of length 5 and 14 feet, respectively, stand 20 feet apart. A cable reaches from the top of one pole to the some point on the ground between the poles and then to the top of the other pole. Express the amount of cable used, L, as a function of the distance of the cable from the 5-foot pole, x.



$a^2 = 5^2 + x^2$

$a = \sqrt{25 + x^2}$

$b^2 = (20 - x)^2 + 14^2$

$b = \sqrt{(20 - x)^2 + 14^2}$

L(x) = ☐ (Simplify your answer. Use radicals as needed.)

$L = a = \sqrt{25 - x^2}$

A football team plays in a large stadium. With a ticket price of \$17, the average attendance at recent games has been 30,000. A market survey indicates that for each \$1 increase in the ticket price, attendance decreases by 400.
a. Express the number of spectators at a football game, N, as a function of the ticket price, x.
b. Express the revenue from a football game, R, as a function of the ticket price, x.

X= Ticket Price

a. Write the function that expresses the number of spectators at a football game, N, as a function of the ticket price, x.

$N(x) = -400x + 36{,}800$ (Simplify your answer.)

b. Write the function that expresses the revenue from a football game, R, as a function of the ticket price, x.

$R(x) = -400x^2 + 36{,}800x$ (Simplify your answer.)

$(17, 30{,}000)$ $(18, 29{,}600)$

x_1 y_1 x_2 y_2

\$17 $P = 30{,}000$

\$18 $P = 29{,}600 = 30{,}000 - 400$

\$19 $P = 29{,}200 = 30{,}000 - 800$

$m = \dfrac{29{,}600 - 30{,}000}{18 - 17} = \dfrac{-400}{1}$

$m = -400$

$y = mx + b$

$y = -400x + b$

$(17, 30{,}000) \longrightarrow 30{,}000 = -400(17) + b$

$30{,}000 = -6800 + b$

$+6800 \quad +6800$

$36800 = b \Rightarrow \underbrace{y = -400x + 36{,}800}_{\text{Population}}$

Price	Pop	Revenue
17	30,000	$17(30{,}000) = 510{,}000$
18	29,600	$18(29{,}600) = 532{,}800$

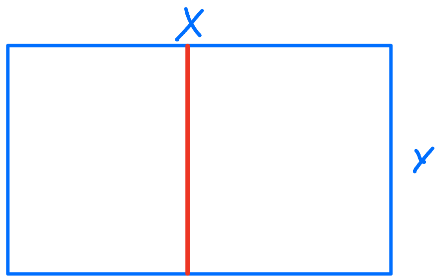
Find Line with points

Revenue = Price • Population

$= x(-400x + 36{,}800)$

A contractor is to build a warehouse whose rectangular floor will have an area of 2000 square feet. The warehouse will be separated into two rectangular rooms by an interior wall. The cost of the exterior walls is $200 per linear foot and the cost of the interior wall is $250 per linear foot. Express the contractor's cost for building the walls, C, as a function of one of the dimensions of the warehouse's rectangular floor, x.

$C(x) = 400x + \frac{1300000}{x}$ (Simplify your answer.)



$\text{Area} = xy$

$2000 = xy$

$\frac{2000}{x} = y$

interior wall = 250

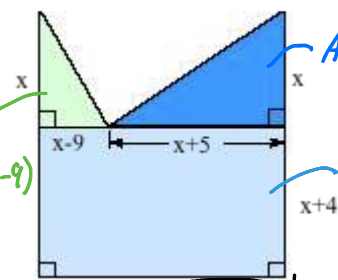
$250 \cdot y = \text{cost}$

Exterior wall 200

$200(2x + 2y) = \text{cost}$

Total cost $250y + 200(2x+2y) = 250\left(\frac{2000}{x}\right) + 400x + 400\left(\frac{2000}{x}\right)$

Express the area of the figure, A, as a function of one of its dimensions, x. Write the function's equation as a polynomial in standard form.



$\text{Area} = \frac{1}{2}(x+5)(x)$

$\text{Area} = \frac{1}{2} \cdot x(x-9)$

$\text{Area} = (x+4)(2x-4)$

$x - 9 + x + 5 = 2x - 4$

$A(x) = 3x^2 + 2x - 16$

$A(x) = (x+4)(2x-4) + \frac{x}{2}(x-9) + \frac{x}{2}(x+5)$

$2x^2 \underbrace{-4x + 8x}_{4x} - 16 + \frac{1}{2}x^2 \underbrace{- 4\frac{1}{2}x + \frac{1}{2}x^2 + 2\frac{1}{2}x}_{-2x}$

$3x^2 + 2x - 16$