Section 3.6: Mathematical Models: Building Functions, pg. 52

Let \( P = (x, y) \) be a point on the function \( y = \sqrt{x} \).

(a) Distance from \((x, y)\) to \((1.75, 0)\):

\[
d = \sqrt{(x - 1.75)^2 + (y - 0)^2} = \sqrt{x^2 - 3.5x + 3.0625 + y^2}
\]

(b) Substitute to get rid of \( y \):

\[
d = \sqrt{x^2 - 3.5x + 3.0625 + (\sqrt{x})^2}
\]

(c.) What is \( d \) if \( x = 0 \)? What is \( d \) if \( x = 1 \)?

\[
d(0) = \sqrt{0 - 3.5(0) + 3.0625} = \sqrt{3.0625} = 1.75
\]

\[
d(1) = \sqrt{1 - 3.5(1) + 3.0625} = \sqrt{1.0625} = 1.0625
\]

(d.) For what value of \( x \) is \( d \) smallest? (absolute minimum)

\[
1.22
\]
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Let \( P = (x, y) \) be a point on the function \( y = \sqrt{x} \).

(a) Distance from \((x, y)\) to \((1.75, 0)\)

\[
d = \sqrt{(x - 1.75)^2 + (y - 0)^2}
\]

\[
d = \sqrt{x^2 - 3.5x + 3.0625 + y^2}
\]

(b) Substitute to get rid of \( y \)

\[
d = \sqrt{x^2 - 3.5x + 3.0625 + \left(\sqrt{x}\right)^2}
\]

\[
d = \sqrt{x^2 - 2.5x + 3.0625}
\]

(c.) What is \( d \) if \( x = 0 \)?

\[
d(0) = \sqrt{0^2 - 2.5(0) + 3.0625} = 1.75
\]

What is \( d \) if \( x = 1 \)?

\[
d(1) = \sqrt{1^2 - 2.5(1) + 3.0625} = 1.5625
\]

(d.) For what value of \( x \) is \( d \) smallest (absolute minimum)

\[
x = 1.22
\]
$A = xy$ (rectangle)

(a) Express the area $A$ of the rectangle as a function of $x$

$$A(x) = x \cdot \frac{9-x^2}{2}$$

(b) What is the domain of $A$?

$(0, 3)$ or $\{0 < x < 3\}$

(c) Graph $A(x)$

*domain comes from the $x$-coordinates of the intercepts

(d) What is the maximum area?

10.39 square units (y-coordinates of the highest point)
4.1 Linear functions and their properties