
Complete the following problem. Show all work to receive full credit.

1. A baseball diamond is a square 90 feet on a side. A player runs from first base to second at a rate of 16 ft/sec. At what rate is the player's distance from third base changing when the player is 30 feet from first base?

Let x = distance from player to second base.

Let r = distance from player to third base.

Then we have

$$x^2 + 90^2 = r^2$$

At the time we care about the player is 30 feet from first base, so the distance to second base is 60 feet, i.e. $x = 60$.

So $r \approx 108.1665383$.

Taking derivatives:

$$2x \frac{dx}{dt} + 0 = 2r \frac{dr}{dt}$$

We know $\frac{dx}{dt} = 16$. Plugging in we get:

$$2(60)(16) = 2(108.1665383) \left(\frac{dr}{dt} \right)$$

$$\frac{dr}{dt} \approx 8.87520314$$

The distance from third base is changing at approximately 8.87 ft/sec.