

Problem 1.30

- (a) At $t = 0$, a pig, initially at the origin, runs along the x axis with constant speed v . At $t = 0$, a farmer, initially 20 yd north of the origin, also runs with constant speed v . If the farmer's instantaneous velocity is always directed toward the instantaneous position of the pig, show that the farmer never gets closer than 10 yd from the pig.
- (b) Now suppose that the pig starts over again from $x = 0$, $y = 0$ at $t = 0$ and starts running with the speed v . The farmer still starts 20 yd north of the pig but can now run at a speed of $\frac{3}{2}v$. The farmer is assisted by his daughter who starts 15 yd south of the pig at $t = 0$ and can run at a speed of $\frac{4}{3}v$. If both the farmer and the farmer's daughter always run toward the instantaneous position of the pig, who catches the pig first?
- (c) At $t = 0$, a pig initially at $(1, 0)$ starts to run around the unit circle with constant speed v . At $t = 0$, a farmer initially at the origin runs with constant speed v and instantaneous velocity directed toward the instantaneous position of the pig. Does the farmer catch the pig?