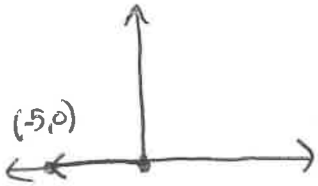
9.3 HW

#9. $\langle -5, 0 \rangle$



Magnitude: $\sqrt{(-5)^2+(0)^2} = \sqrt{25} = \boxed{5}$

Direction: $180°$ or π

#11 4 is magnitude, 180° is direction

$\langle 4\cos(180), 4\sin(180) \rangle = \langle -4, 0 \rangle$

#17 $\vec{u} = \langle 3, -2 \rangle$ $\vec{v} = \langle -2, 5 \rangle$

a) $3\vec{u} = \langle 9, -6 \rangle$ b) Magnitude: $\sqrt{9^2+(-6)^2} = \sqrt{81+36} = \sqrt{117}$

#23 a) $\frac{3}{5}\vec{u} + \frac{4}{5}\vec{v} = \langle \frac{9}{5}, -\frac{6}{5} \rangle + \langle -\frac{8}{5}, 4 \rangle = \langle \frac{1}{5}, \frac{14}{5} \rangle$

b) $\sqrt{\left(\frac{1}{5}\right)^2+\left(\frac{14}{5}\right)^2}$

#27 $\vec{r}(t) = \langle 3t^2, 2t^3 \rangle$ $\vec{v}(t) = \langle 6t, 6t^2 \rangle$ $\vec{a}(t) = \langle 6, 12t \rangle$

Product rule w/ chain — chain

#29 $\vec{r}(t) = \langle te^{-t}, e^{-t} \rangle$ $\vec{v}(t) = \langle t(-e^{-t}) + e^{-t}, -e^{-t} \rangle = \langle -te^{-t} + e^{-t}, -e^{-t} \rangle$

chain — chain

$\vec{a}(t) = \langle -t(-e^{-t}) - 1 \cdot e^{-t} - e^{-t}, e^{-t} \rangle = \langle te^{-t} - 2e^{-t}, e^{-t} \rangle$

#31 $\vec{r}(t) = \langle t^2 + \sin 2t, t^2 - \cos 2t \rangle$ $\vec{v}(t) = \langle 2t + 2\cos 2t, 2t + 2\sin 2t \rangle$

$\vec{a}(t) = \langle 2 - 4\sin 2t, 2 + 4\cos 2t \rangle$

#33 a) horizontal component of position: launch velocity * time * cos(launch angle)

vertical component of position: launch velocity * time * sin(launch angle) $- 16t^2$

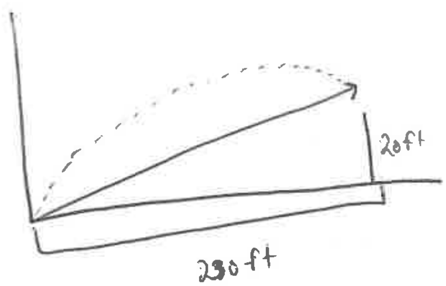
launch velocity 90 ft/sec

launch angle is 55°

$\vec{r}(t) = \langle 90t\cos(55),\ 90t\sin(55) - 16t^2 \rangle$

b) $\vec{v}(t) = \langle 90\cos(55),\ 90\sin(55) - 32t \rangle$

c)



Position is important: Let's use the horizontal distance:

$$230 = 90t\cos(55)$$

$$\frac{230}{90\cos(55)} = t$$

Now check vertical distance $\quad 90 \cdot \frac{230}{90\cos(55)} \cdot \sin(55) - 16\left(\frac{230}{90\cos(55)}\right)^2 = 10.854\text{ft} < 20\text{ft}$

That is over 9ft short on the wall. No homerun.

d) $230 = 90t\cos(55)$

$$t = \frac{230}{90\cos(55)} = 4.455 \text{ sec}$$

e) fast: speed $= |\vec{v}(t)| = \sqrt{(90\cos(55))^2 + (90\sin(55) - 32t)^2}$

The ball hits the fence at $t = 4.455$ sec

$$\sqrt{(90\cos(55))^2 + (90\sin(55) - 32(4.455))^2} = 86.055 \text{ ft/sec}$$

#35. $\vec{r}(t) = \langle \cos 3t, \sin 2t \rangle$

$\vec{v}(t) = \langle -3\sin 3t, 2\cos 2t \rangle$

$\vec{a}(t) = \langle -9\cos 3t, -4\sin 2t \rangle$