Annoucements

1. Changed WebAssign so that homework sets are visible as soon as they are posted, but the due dates remain the same. (Some of the problems have been changed from original schedule.)
2. Keep up your homework notebooks.
3. Start reading Chapter 5 for next time.

Motion in two dimensions

Summary of equations describing trajectory motion:

Parametric equations:

$$v_x(t) = v_{xi}$$

$$x(t) = x_i + v_{xi}\, t$$

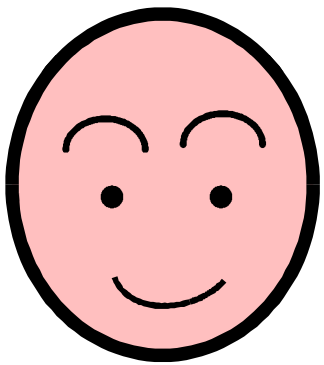
$$v_y(t) = v_{yi} - g\, t$$

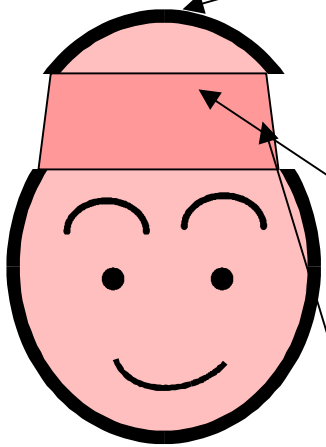
$$y(t) = y_i + v_{yi}\, t - \tfrac{1}{2}\, g\, t^2$$

Spatial trajectory:

$$y(t) = y_i + v_{yi}\left(\frac{x(t) - x_i}{v_{xi}}\right) - \frac{1}{2} g \left(\frac{x(t) - x_i}{v_{xi}}\right)^2$$

Adobe Acrobat Document





$$\mathbf{v}_x = \frac{dx}{dt}$$

$$\mathbf{a}_x = \frac{dv_x}{dt}$$

$v_x(t) = v_{xi}$

$x(t) = x_i + v_{xi}\, t$

$v_y(t) = v_{yi} - g\, t$

$y(t) = y_i + v_{yi}\, t - \frac{1}{2} g\, t^2$

$$y(t) = y_i + v_{yi}\left(\frac{x(t) - x_i}{v_{xi}}\right) - \frac{1}{2} g \left(\frac{x(t) - x_i}{v_{xi}}\right)^2$$

Advice:

1. Keep basic concepts and equations at the top of your head.
2. Construct an equation sheet of commonly used equations for consultation in problem solving (homework and exams).

Peer instruction question

Suppose an outfielder is a distance of 120m from home plate. As soon as the ball leaves the bat with $v_{xi}=v_{yi}=30$m/s, the outfielder starts running to catch the ball. Estimate the average velocity of the outfielder if he is to catch the ball.

(a) 10m/s (b) 20 m/s (c) 30 m/s (d) 60 m/s

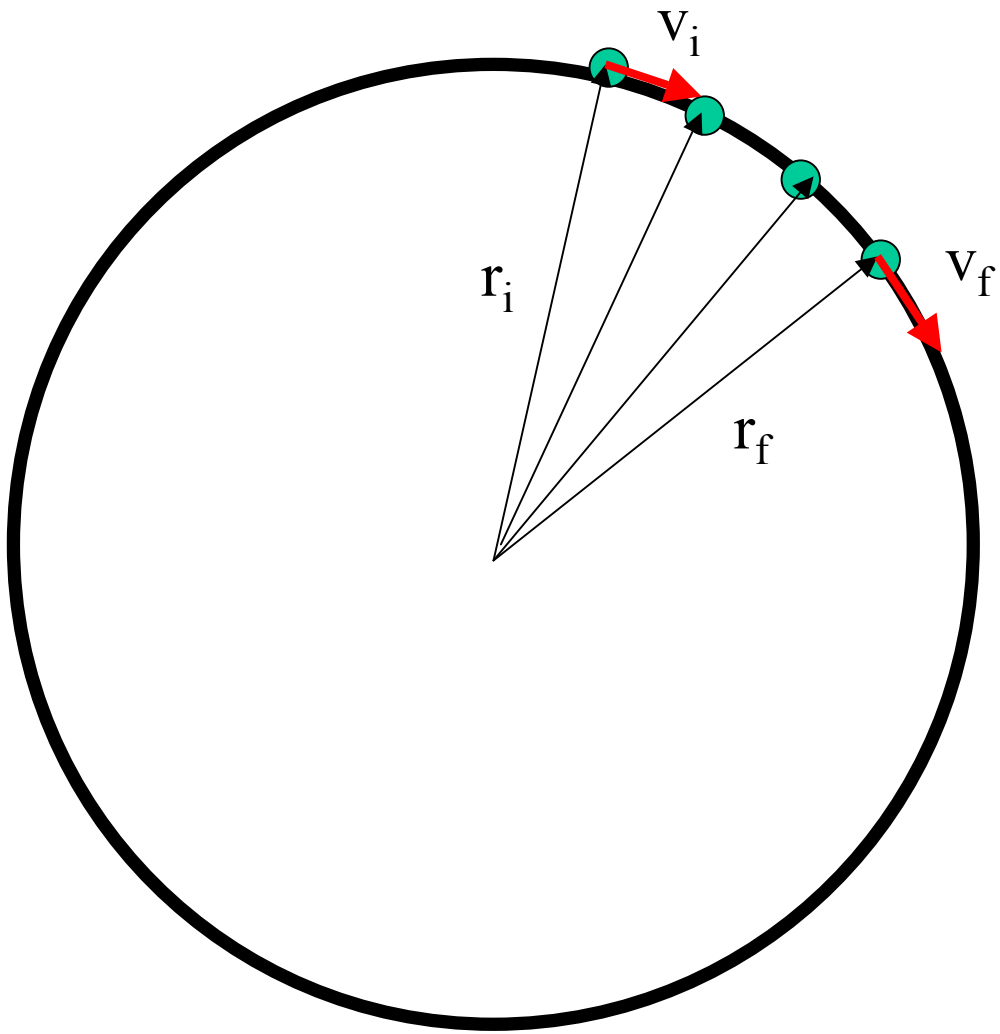

v_i
r_i
v_f
r_f

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Figure 4.16bc

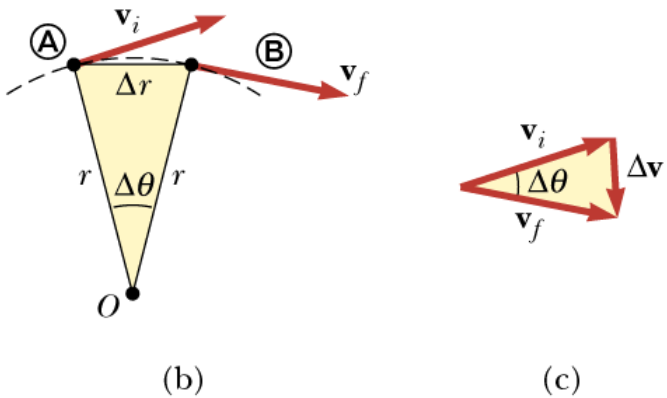

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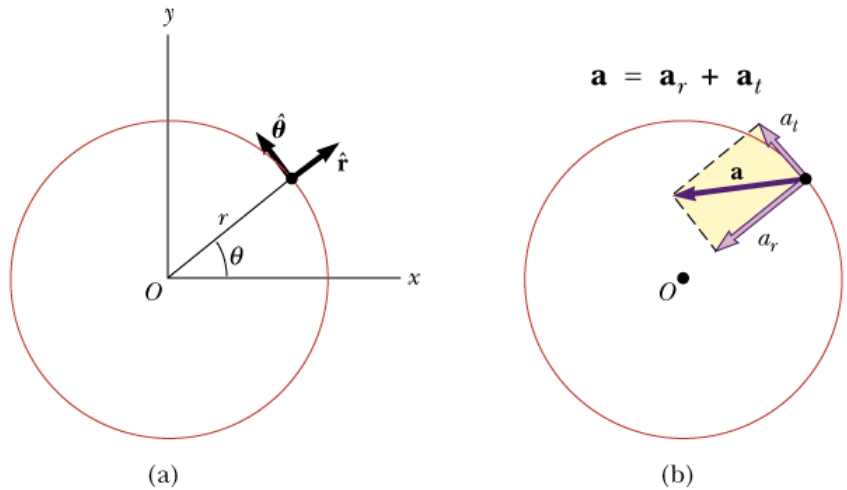
Figure 4.18



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if $v_i = v_f$, then: $\mathbf{a} = -\frac{v^2}{r}\hat{\mathbf{r}}$

For example, suppose v=5m/s, r=0.5m; a=-50 $\hat{\mathbf{r}}$ m/s^2.

On line quiz

Think about riding on a merry-go-round. Suppose that you start the merry-go-round rotating and then jump on. After you jump on, the merry-go-round continues to rotate, gradually slowing down. The questions below pertainto you standing on the rotating merry-go-round at a point near the edge.

1. What is the direction of your velocity?

   (a) tangential (b) radial (c) up (d) down

2. Do you have a tangential component of acceleration?

3. Do you have a radial component of acceleration?

4. Do you have a vertical component of acceleration?

Addition of accelerations:

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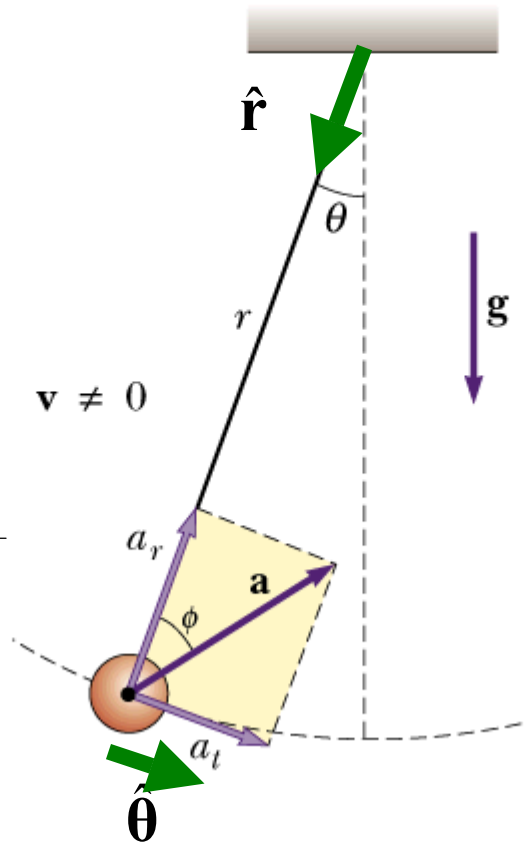
Figure 4.19



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$$a_r = -\frac{v^2}{r}$$

$$a_\theta = g\sin\theta$$