# X1.7 205

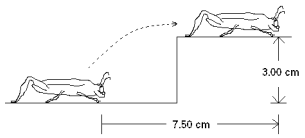
**PHYS-205(7) (Kaldon-21297)** **Name** _____
**WMU - Winter 2001**
**Exam 1 - 100,000 points + 20,000 ☆ points** **Book Title** _____

1/24/2001•Rev.5

**State Any Assumptions You Need To Make – Show All Work – Circle Any Final Answers**
**Use Your Time Wisely – Work on What You Can – Be Sure to Write Down Equations**
**Feel Free to Ask Any Questions** ☐☆2a ☐☆2b ☐☆2c ☐☆2e

## Crickets, Grasshoppers, Locusts – This Problem Bugs Me (50,000 points)

1.) A grasshopper hops up onto a small ledge, moving forward a distance of 7.50 cm (0.0750 m) and up a distance of 3.00 cm (0.0300 m). We will ignore the time & distance it takes for the grasshopper to speed up and also to stop, assuming that at *t=0* the grasshopper is moving at $v_{0x}$ and $v_{0y}$. (a) Find the time it takes the grasshopper to hop onto the ledge. *Note: The time it takes to jump up to the ledge is the same as the time it takes to free fall down from the ledge.*

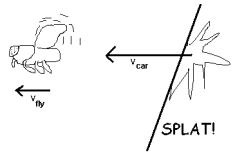



(b) Find the initial speed in the *y*-direction, $v_{0y}$. *You can solve this problem without the answer to (a).*

(c) Find the initial speed in the *x*-direction, $v_{ox}$. *If you didn't get an answer to (a), use t = 0.0543 sec.*

(d) What is the acceleration in the *x*-direction, $a_x$ ? What is the acceleration in the *y*-direction, $a_y$ ?

(e) A fly is flying at a speed $v_{fly} = 10.0\ m/s$ when it gets hit by the windshield of a car moving in the same direction at a speed $v_{car} = 25.0\ m/s$. In a distance of 5.00 mm (0.00500 m), the fly is accelerated to the speed of the car. What is the acceleration of the fly? How many *gee's* is this?






## It's a New Millennium • Time For New Star Problems (50,000 points)

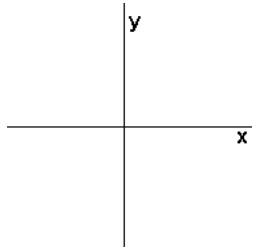
2.) An object's equation of motion is $v_y(t) = 6.00 m/s + (6.00 m/s^2)t + (6.00 m/s^3)t^2 + (6.00 m/s^6)t^5$.

☆(a) Find the equation for the vector position of this object.

☆(b) Find the equation for the vector velocity of this object.

☆(c) Find the equation for the vector acceleration of this object.

(d) Sketch the vector $\vec{C} = \vec{A} + \vec{B}$, where $\vec{A} = 11.8\ m/s\ @\ 102°$ and $\vec{B} = -12.1 m/s\,\hat{i} - 3.93 m/s\,\hat{j}$. Find $C_x$ and $C_y$.




☆(e) An object has its position given as $x(t) = (6.00 m/s^6)t^6$ Find the sixth derivative of *x* with respect to time at time *t = 1.00 sec.*