

**Differential Equations (92.236)**  
**Homework Assignment #2 Spring 2007**  
*Integrals as General and Particular Solutions*

**Problem 1**

Solve the following initial value problems (IVPs) of the form:  $y' = f(x)$  with  $y(x_0) = y_0$ .

- a.  $\frac{dy}{dx} = \frac{1}{x^2}$  with  $y(1) = 5$
- b.  $\frac{dy}{dx} = \frac{1}{\sqrt{x+2}}$  with  $y(2) = -1$
- c.  $\frac{dy}{dx} = xe^{-x}$  with  $y(0) = 1$
- d.  $\frac{dy}{dx} = 2\sin 3x + x^2$  with  $y(0) = 6$

**Problem 2**

A driver involved in an accident in icy conditions claims he was going only 25 mph. When the police tested his car, they found that when its brakes were applied at 25 mph under similar conditions, the car skidded about 45 feet before coming to a stop. But the driver's skid marks at the accident scene measured 210 feet! Assuming the same constant deceleration, estimate the speed he was actually traveling just prior to the accident.

**Problem 3**

A diesel car gradually speeds up so that, for the first 10 seconds, its acceleration is given by

$$\frac{dv}{dt} = 0.12t^2 + 0.6t \quad \text{ft/s}^2$$

If the car starts from rest, find the distance it has traveled at the end of 10 seconds and its velocity at that time.

**Problem 4**

A stone is dropped from rest at initial height,  $h$ , above the surface of the earth. Show that, assuming negligible air friction, the speed at which it strikes the ground is  $v = \sqrt{2gh}$ .