Worksheet #18 **11-12-15** **NAME:** ____________________

TURN THIS WORKSHEET IN AT THE END OF CLASS

LECTURE: Definition and basic rules for computing anti-derivatives:

1) In each case, find the general antiderivative:

(a) $\int 3x^4 - 4\sqrt{x} + \frac{7}{x^2}\, dx$,

(b) $\int \frac{1}{\sqrt{1-x^2}}\, dx$

(c) $\int \frac{1}{2x^3} + \csc x \cot x\, dx$

(d) $\int (\sec^2 x + \frac{3}{\sqrt{x}} - \pi)\, dx$

(e) $\int \frac{x^2-3}{2x}\, dx$

(f) $\int \frac{x^2}{x^2+1}\, dx$

2) In each case, find the most general form of f satisfying the given condition.

(a) $f'(x) = x(3x+4)$

(b) $f''(x) = \sqrt[3]{x} + 1$

LECTURE BREAK: Initial value problems; Rectilinear motion.

3) Solve the following initial value problems:

(a) $\frac{dy}{dx} = 6e^x, \;\; y(0) = 2$

(b) $\frac{dy}{dx} = \sqrt{x}(6+5x), \;\; y(1)$

4) A particle is moving on a straight line with the given data. Find the position $s(t)$ of the particle at time t.

(a) $v(t) = -32t + 100, \;\; s(0) = 20,$

(b) $a(t) = 2\cos t + \sin t, \;\; v(0) = 1, \;\; s(0) = 0$.

5) A stone is dropped from the top of a tower 800 ft above the ground.

(a) Find the height $s(t)$ of the stone above the ground at t seconds since it was dropped. Assume the initial velocity is 0 and assume constant acceleration during the motion $a = -32ft/s^2$ (the gravitational acceleration, often denoted g).

(b) How long does it take the stone to reach the ground?

(c) With what velocity does it strike the ground?

6) Show that for motion in straight line with **constant** acceleration a, initial velocity v_0 and initial position s_0, the velocity $v(t)$ at time t and the position $s(t)$ at time t are given by

$$v(t) = at + v_0, \qquad s(t) = \frac{1}{2}at^2 + v_0 t + s_0$$

7) A car braked with constant deceleration of 16ft/s^2, producing skid marks measuring 200ft before coming to a stop. How fast was the car traveling when the brakes were applied?