EF 151 Exam #3, Fall, 2005

This exam consists of 10 short-answer questions, each worth 10 points.

Be sure to:
• Show all of your work
• Include units for all answers
• Include the correct number of significant digits
• Include directions for all vectors
• Write your final answer in the box provided

Hints:
• Stay calm
• Glance over all problems, tackle the "easy" ones first
• Use reasonableness to guide you
• Allow yourself an average of 5 minutes per problem

Useful Conversions
• 1 gallon = 231 cubic inches
• 1 gallon = 4 quarts
• 1 gallon = 128 fluid ounces
• 1 m$^3$ = 1000 L
• 1 acre = 43,560 ft$^2$
• 1 mile = 8 furlongs
• 1 fathom = 6 ft
• 1 rod = 16.5 ft
• 1 chain = 22 yards
• 1 inch = 25.4 mm
• 1 watt = 1 N m/sec
• 1 hp = 745.7 watts (approx.)
• 1 hp = 550 ft lb / sec
• 1 lb = 4.45 N (approx.)
• 1 m = 1000 mm
• 1 g = 32.2 ft/sec$^2$ = 9.81 m/sec$^2$

Geometry/Trig
• Area of a circle = $\pi r^2$
• Volume of a cylinder = $\pi r^2 h$
• Law of Sines
  $$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$
• Law of Cosines
  $$c^2 = a^2 + b^2 - 2ab \cos C$$

Constant Acceleration
$$v_2 = v_1 + a\Delta t$$
$$s_2 = s_1 + \left(\frac{v_1 + v_2}{2}\right)\Delta t$$
$$s_2 = s_1 + v_1\Delta t + \frac{1}{2}a\Delta t^2$$
$$s_2 = s_1 + \frac{v_2^2 - v_1^2}{2a}$$

Uniform Circular Motion
$$a_n = \frac{v^2}{\rho}$$ (any curve)
$$a_n = \rho \omega^2$$
$$v = \omega \rho$$
$$T = \frac{2\pi}{\omega}$$
$$f = \frac{1}{T}$$
$$\Delta s = \rho \Delta \phi$$
$$\omega = 2\pi f$$

Projectile Motion
$$y = x \tan \theta + x^2\left(\frac{-g(1 + \tan^2 \theta)}{2v_0^2}\right)$$
Assumes origin at launch point
$\theta$ – launch angle
$v_0$ – launch velocity

Relative Motion
$$v_B = v_A + v_{B/A}$$