Math B1131, Quiz #2, Fall 2012 Name KEY

Instructions: show all work. Use exact answers unless explicitly asked to do otherwise.

1. Find y subject to the given initial conditions.
   a. $y' = -x^2 + 2x. y(2) = 1$

$y = \int -x^2 + 2x \, dx$

$y = \frac{-x^3}{3} + x^2 + C$

$1 = -\frac{8}{3} + 4 + C$

$C = -1/3$

$\boxed{y = -\frac{x^3}{3} + x^2 + (-1/3)}$

   b. $y'' = x + 1, y'(0) = 3, y(1) = 16$

$y' = \int x + 1 \, dx$

$y' = \frac{x^2}{2} + x + C$

$C = 3$

$y' = \frac{x^2}{2} + x + 3$

$y = \int \frac{x^2}{2} + x + 3 \, dx$

$y = \frac{x^3}{6} + \frac{x^2}{2} + 3x + C$

$16 = \frac{1}{6} + \frac{1}{2} + 3 + C$

$C = 37/3$

$\boxed{y = \frac{x^3}{6} + \frac{x^2}{2} + 3x + \frac{37}{3}}$

2. Find the anti-derivatives.
   c. $\int 3e^{3x} dx$

$\frac{\cancel{3}e^{3x}}{\cancel{3}} + C = \boxed{e^{3x} + C}$

OR explicitly:

$u = 3x$

$du = 3dx \rightarrow \frac{1}{3}du = dx$

$\int \frac{1}{\cancel{3}} \cdot \cancel{3} e^u \, du = \int e^u \, du = e^u + C$

$= e^{3x} + C$

   d. $\int x(x^2 + 1)^3 dx$

$= \int \frac{1}{2} u^3 \, du$

$u = x^2 + 1$

$du = 2x \, dx$

$\frac{1}{2} du = x \, dx$

$\frac{1}{2} \cdot \frac{u^4}{4} + C$

$\boxed{\frac{1}{8}(x^2+1)^4 + C}$