Math 108 **Name** (print)_____

Quiz 10 **Spring 2006**

Work carefully and neatly. You must show all relevant work! You may receive no credit if there is insufficient work. NO GRAPHING CALCULATORS!

[3pts] 1. Find the integral: $\int (e^x + x^3)dx$.

$$= \int e^x \, dx + \int x^3 \, dx = e^x + \frac{1}{4}x^4 + C$$

[3pts] 2. Find a function $f(x)$, such that $f'(x) = x^3 - 2x + 1$ and $f(2) = 5$.

$f(x) = \int x^3 - 2x + 1 \, dx = (1/4)x^4 - x^2 + x + C$
Then $5 = f(2) = (1/4)2^4 - 2^2 + 2 + C = (1/4)(16) - 4 + 2 + C = 4 - 4 + 2 + C$
Thus $5 = 2 + C$ or $C = 3$. Hence $f(x) = (1/4)x^4 - x^2 + x + 3$

[4pts] 3. Find the integral $\int 4x\sqrt{x^2+5} \, dx$

Set $u = x^2 + 5$. Then $du = 2xdx$. Hence the original integral becomes

$$\int 4x\sqrt{x^2+5} \, dx = 2\int 2x\sqrt{x^2+5} \, dx = 2\int \sqrt{u} \, du = 2\int u^{(1/2)} du = 2(2/3)u^{(3/2)} + C$$

Simplifying and putting x back we get:

$$= (4/3)(x^2+5)^{(3/2)} + C$$