Quiz 18

MATH 139-01 and -02
Tuesday, December 2, 2003

Be sure to **show your work**. Unsupported answers receive no credit.

1. Find each indefinite integral. Be sure to show all work.

   (a) $\displaystyle\int \frac{3x^2+1}{(x^3+x-2)^4}dx$

   Solution: Let $u = x^3 + x - 2$. Then $du = (3x^2+1)dx$, so we have $\displaystyle\int \frac{1}{u^4}du = \int u^{-4}du = -\frac{1}{3}u^{-3} + C = -\frac{1}{3(x^3+x-2)^3} + C$.

   (b) $\displaystyle\int 2x\sqrt{4x^2+16}dx$

   Solution: Let $u = 4x^2+16$. Then $du = 8xdx$, so we have $\displaystyle\frac{1}{4}\int 8x(4x^2+16)^{1/2}dx = \frac{1}{4}\int u^{1/2}du = \frac{1}{4}\cdot\frac{2}{3}u^{3/2} + C = \frac{1}{6}\sqrt{(4x^2+16)^3} + C$.

   (c) $\displaystyle\int \frac{x}{x^2+1}dx$

   Solution: Let $u = x^2 + 1$. Then $du = 2xdx$, and we get $\displaystyle\frac{1}{2}\int \frac{2x}{x^2+1}dx = \frac{1}{2}\int \frac{1}{u}du = \frac{1}{2}\ln|u| + C = \frac{1}{2}\ln(x^2+1) + C$.

2. Use the Fundamental Theorem to evaluate $\displaystyle\int_0^1 (2x-1)e^{x^2-x}dx$.

   Solution: Let $u = x^2 - x$. Then $du = (2x-1)dx$. When $x = 0, u = 0$. When $x = 1, u = 0$. Thus, we get $\displaystyle\int_0^0 e^u du = e^u\Big|_0^0 = 1 - 1 = 0$.