PRINT Your Name:_____

Quiz 4 — September 15, 2010 – Section 9 – 10:10 – 11:00

Remove everything from your desk except this page and a pencil or pen.

Circle your answer. **Show your work.** **Check** your answer.
The quiz is worth 5 points.

Find $\int \frac{5x^2+3x-2}{x^3+2x^2}dx$.

Answer: Apply the technique of partial fractions. Observe that

$$x^3 + 2x^2 = x^2(x+2).$$

Write

$$\frac{5x^2+3x-2}{x^3+2x^2} = \frac{A}{x} + \frac{B}{x^2} + \frac{C}{x+2}.$$

Mulitply both sides by $x^2(x+2)$ to obtain

$$5x^2+3x-2 = Ax(x+2) + B(x+2) + Cx^2 = Ax^2 + 2Ax + Bx + 2B + Cx^2$$

$$= (A+C)x^2 + (2A+B)x + 2B.$$

Equate the corresponding coefficients:

$$5 = A + C, \quad 3 = 2A + B, \quad -2 = 2B.$$

We conclude that $B = -1$. We also have $4 = 3 + 1 = 3 - B = 2A$; so $A = 2$. We also have $3 = 5 - 2 = 5 - A = C$. We check this much:

$$\frac{2}{x} + \frac{-1}{x^2} + \frac{3}{x+2} = \frac{2x(x+2) - (x+2) + 3x^2}{x^2(x+2)} = \frac{2x^2+4x-x-2+3x^2}{x^2(x+2)}$$

$$= \frac{5x^2+3x-2}{x^2(x+2)},$$

as expected. So,

$$\int \frac{5x^2+3x-2}{x^3+2x^2}dx = \int \left(\frac{2}{x} + \frac{-1}{x^2} + \frac{3}{x+2}\right)dx = \boxed{2\ln|x| + \frac{1}{x} + 3\ln|x+2| + C}.$$