

PRINT Your Name: _____

Quiz 5 — February 14, 2014 – Section 8 – 10:50 – 11:40

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

The solution will be posted soon after the quiz is given.

Circle your answer. **Show your work.** Your work must be correct and coherent. Check your answer.

The quiz is worth 5 points.

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

Answer: We apply the technique of partial fractions and find constants A , B , and C with

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

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

$$\begin{aligned} 5x^2 + 3x - 2 &= Ax(x + 2) + B(x + 2) + Cx^2 \\ &= Ax^2 + 2Ax + Bx + 2B + Cx^2. \end{aligned}$$

Equate the corresponding coefficients to see that

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

It follows that $B = -1$, $A = 2$, and $C = 3$. We verify that

$$\begin{aligned} \frac{2}{x} + \frac{-1}{x^2} + \frac{3}{x+2} &= \frac{2x(x+2) - (x+2) + 3x^2}{x^2(x+2)} = \frac{2x^2 + 4x - x - 2 + 3x^2}{x^3 + 2x^2} \\ &= \frac{5x^2 + 3x - 2}{x^3 + 2x^2}. \end{aligned}$$

Now we do the integral

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