

PRINT Your Name: \_\_\_\_\_

**Quiz 5 — September 18, 2009 – 9:05 section**

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

**Circle** your answer. **Show your work.**

The quiz is worth 5 points.

Find  $\int \frac{y^2 dy}{\sqrt{3-4y}}$ . **Check your answer.**

**Answer:** We do a change of variables. Suppose that the expression under the radical was just a variable, then we could do algebraic tricks to finish the problem! We make it so! Let  $u = 3 - 4y$ . It follows that  $du = -4dy$ . The original problem is equal to

$$\begin{aligned} \int \frac{\left(\frac{3-u}{4}\right)^2 du}{-4\sqrt{u}} &= \frac{1}{-64} \int \frac{(3-u)^2 du}{\sqrt{u}} \\ &= \frac{1}{-64} \int \frac{(9-6u+u^2)du}{\sqrt{u}} = \frac{1}{-64} \int (9u^{-1/2} - 6u^{1/2} + u^{3/2})du \\ &= \frac{1}{-64} \left( 9u^{1/2} \cdot 2 - 6u^{3/2} \cdot \frac{2}{3} + u^{5/2} \cdot \frac{2}{5} \right) + C \\ &= \boxed{\frac{1}{-64} \left( 9(3-4y)^{1/2} \cdot 2 - 6(3-4y)^{3/2} \cdot \frac{2}{3} + (3-4y)^{5/2} \cdot \frac{2}{5} \right) + C} \end{aligned}$$

**Check:** The derivative of the proposed answer is

$$\begin{aligned} &\frac{1}{-64} \left( 9(3-4y)^{-1/2}(-4) - 6(3-4y)^{1/2}(-4) + (3-4y)^{3/2}(-4) \right) \\ &= \frac{(3-4y)^{-1/2}(-4)}{-64} (9 - 6(3-4y) + (3-4y)^2) \\ &= \frac{1}{16\sqrt{3-4y}} (9 - 18 + 24y + 9 - 24y + 16y^2) = \frac{1}{16\sqrt{3-4y}} (16y^2) = \frac{y^2}{\sqrt{3-4y}} \checkmark. \end{aligned}$$