PRINT Your Name:____________________

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

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

$\boxed{\text{Circle}}$ 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

$$\int \frac{\left(\frac{3-u}{4}\right)^2 du}{-4\sqrt{u}} = \frac{1}{-64} \int \frac{(3-u)^2 du}{\sqrt{u}}$$

$$= \frac{1}{-64} \int \frac{(9 - 6u + u^2)du}{\sqrt{u}} = \frac{1}{-64} \int (9u^{-1/2} - 6u^{1/2} + u^{3/2})du$$

$$= \frac{1}{-64} \left(9u^{1/2}2 - 6u^{3/2}\frac{2}{3} + u^{5/2}\frac{2}{5}\right) + C$$

$$= \boxed{\frac{1}{-64} \left(9(3-4y)^{1/2}2 - 6(3-4y)^{3/2}\frac{2}{3} + (3-4y)^{5/2}\frac{2}{5}\right) + C}$$

Check: The derivative of the proposed answer is

$$\frac{1}{-64} \left(9(3-4y)^{-1/2}(-4) - 6(3-4y)^{1/2}(-4) + (3-4y)^{3/2}(-4)\right)$$

$$= \frac{(3-4y)^{-1/2}(-4)}{-64} \left(9 - 6(3-4y) + (3-4y)^2\right)$$

$$= \frac{1}{16\sqrt{3-4y}} \left(9 - 18 + 24y + 9 - 24y + 16y^2\right) = \frac{1}{16\sqrt{3-4y}} \left(16y^2\right) = \frac{y^2}{\sqrt{3-4y}} \checkmark.$$