PRINT Your Name:____________________

Quiz 5 — September 26, 2012 – Section 10 – 11:15 – 12:05

Remove everything from your desk except a pencil or pen.

Circle your answer. **Show your work.** Your work should be correct and coherent. **CHECK** your answer.
The quiz is worth 5 points.

Find $\int \frac{1}{x\sqrt{4x+1}}\,dx$. **Check your answer.**

Let $u = \sqrt{4x+1}$. It follows that $du = \frac{4}{2\sqrt{4x+1}}dx = \frac{2}{\sqrt{4x+1}}dx$. We will use this in the form $\frac{1}{2}du = \frac{1}{\sqrt{4x+1}}dx$. We solve $u = \sqrt{4x+1}$ for x to see that $\frac{1}{4}(u^2-1) = x$. The original problem is equal to

$$4\left(\frac{1}{2}\right)\int \frac{1}{u^2-1}\,du = 2\int \frac{1}{u^2-1}\,du = \left(\int \frac{1}{u-1} - \frac{1}{u+1}\right)du$$

$$= \ln|u-1| - \ln|u+1| + C = \boxed{\ln|\sqrt{4x+1}-1| - \ln|\sqrt{4x+1}+1| + C.}$$

Check . The derivative of the proposed answer is

$$\frac{\frac{4}{2\sqrt{4x+1}}}{\sqrt{4x+1}-1} - \frac{\frac{4}{2\sqrt{4x+1}}}{\sqrt{4x+1}+1} = \frac{4}{2\sqrt{4x+1}}\frac{\left(\sqrt{4x+1}+1\right) - \left(\sqrt{4x+1}-1\right)}{(4x+1)-1}$$

$$= \frac{4}{2\sqrt{4x+1}}\frac{2}{4x}. \checkmark$$