

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

$$\begin{aligned} 4 \left( \frac{1}{2} \right) \int \frac{1}{u^2 - 1} du &= 2 \int \frac{1}{u^2 - 1} du = \left( \int \frac{1}{u - 1} - \frac{1}{u + 1} \right) du \\ &= \ln |u - 1| - \ln |u + 1| + C = \boxed{\ln |\sqrt{4x + 1} - 1| - \ln |\sqrt{4x + 1} + 1| + C.} \end{aligned}$$

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

$$\begin{aligned} \frac{\frac{4}{2\sqrt{4x+1}}}{\sqrt{4x+1} - 1} - \frac{\frac{4}{2\sqrt{4x+1}}}{\sqrt{4x+1} + 1} &= \frac{4}{2\sqrt{4x+1}} \frac{(\sqrt{4x+1} + 1) - (\sqrt{4x+1} - 1)}{(4x+1) - 1} \\ &= \frac{4}{2\sqrt{4x+1}} \frac{2}{4x} \cdot \checkmark \end{aligned}$$