

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

**Quiz 5 — September 16, 2011 — Section 7 — 10:10 — 11:00**

**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  $\int \arctan \sqrt{x} dx$ .

**Answer:** Let  $w = \sqrt{x}$ . It follows that  $dw = \frac{1}{2\sqrt{x}} dx$ . In other words,  $2w dw = dx$ . The original integral is  $2 \int w \arctan w dw$ . We use integration by parts. Let  $u = \arctan w$  and  $dv = w$ . We compute  $du = \frac{dw}{1+w^2}$  and  $v = \frac{w^2}{2}$ . The original integral is:

$$\begin{aligned} & 2 \left[ \frac{w^2}{2} \arctan w - \int \frac{w^2}{2} \frac{dw}{1+w^2} \right] = w^2 \arctan w - \int \frac{w^2}{1+w^2} dw \\ & = w^2 \arctan w - \int \left[ 1 - \frac{1}{1+w^2} \right] dw = w^2 \arctan w - w + \arctan w + C \\ & = \boxed{(x+1) \arctan \sqrt{x} - \sqrt{x} + C}. \end{aligned}$$

Check: The derivative of the proposed answer is:

$$(x+1) \frac{1}{2\sqrt{x}(1+x)} + \arctan \sqrt{x} - \frac{1}{2\sqrt{x}} = \arctan \sqrt{x}. \quad \checkmark$$