Math 152 Quiz 7 Name: KEY

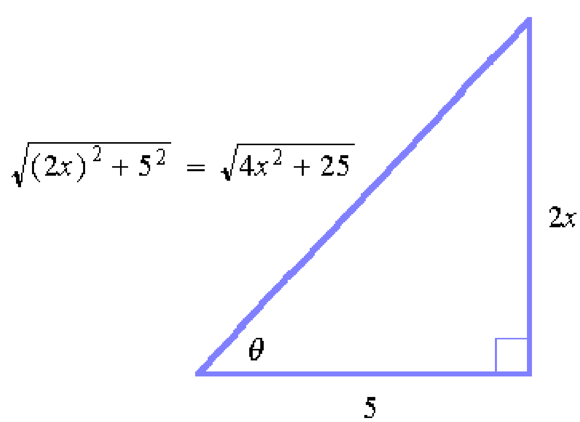
1. Use an appropriate trigonometric substitution to rewrite the following integral as a trigonometric integral in terms of the variable θ. Do not evaluate the integral, but do simplify the integrand (the stuff inside the integral) as much as possible.

$$\int \frac{\sqrt{9x^2-16}}{x}dx$$

$$\begin{aligned} 3x &= 4\sec\theta \\ x &= \frac{4}{3}\sec\theta \\ dx &= \frac{4}{3}\sec\theta\tan\theta d\theta \end{aligned}$$

$$\begin{aligned} \int \frac{\sqrt{9x^2-16}}{x}dx &= \int \frac{\sqrt{9\left(\frac{4}{3}\sec\theta\right)^2-16}}{\frac{4}{3}\sec\theta}\cdot\frac{4}{3}\sec\theta\tan\theta d\theta \\ &= \int \frac{4\tan\theta}{\frac{4}{3}\sec\theta}\cdot\frac{4}{3}\sec\theta\tan\theta d\theta \\ &= \int 4(\tan\theta)^2 d\theta \end{aligned}$$

2. Robin, a student in a Calculus II class, is in the middle of completing a trigonometric substitution problem using the substitution $2x = 5\tan\theta$. After evaluating the integral, Robin arrived at the answer $\cos\theta + 2\sec\theta + \frac{1}{2}\theta + C$. Finish this problem. (That is, "go back to x's" and simplify the answer as much as possible.)



$$\cos\theta + 2\sec\theta + \frac{1}{2}\theta + C = \frac{5}{\sqrt{4x^2+25}} + \frac{2\sqrt{4x^2+25}}{5} + \frac{1}{2}\arctan\left(\frac{2x}{5}\right) + C$$