

SHOW ALL WORK!!! Unsupported answers might not receive full credit.

Problem 1 [4 points] For the integral:

$$\int \frac{27x^2}{(4+9x^2)^{3/2}} dx$$

find an appropriate constant C and an appropriate trigonometric substitution of one of the forms $x = C \sin \theta$, $x = C \sec \theta$, or $x = C \tan \theta$ to simplify the integral. Then, perform any trigonometric manipulations necessary and evaluate the integral.

$C = 2/3$

$x = 2/3 \tan \theta$

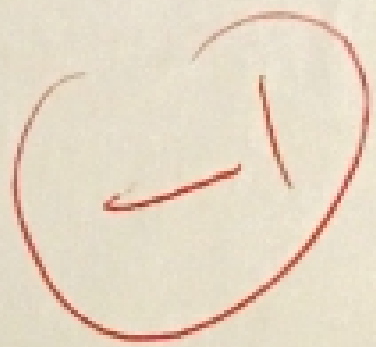
$x^2 = 4/9 \tan^2 \theta$

$dx = 2/3 \sec^2 \theta d\theta$

$$\int \frac{27 (4/9 \tan^2 \theta)}{(4 + 4 \tan^2 \theta)^{3/2}} (2/3 \sec^2 \theta) d\theta$$

$$\int \frac{12 \tan^2 \theta}{(4 \sec^2 \theta)^{3/2}} (2/3 \sec^2 \theta) d\theta$$

$$\int \frac{8 \tan^2 \theta}{(2 \sec \theta)^3} (\sec^2 \theta) d\theta$$



$$\int \frac{8 \tan^2 \theta}{8 \sec^3 \theta} d\theta = \frac{\sin^2 \theta}{\cos^2 \theta} d\theta = \int \sin^2 \theta / \cos \theta d\theta$$

$u = \sin \theta$
 $du = \cos \theta d\theta$
 $\int u^2 du = u^3 / 3$

$\frac{\sin^3 \theta}{3} + C$