

MAT 137 (Calculus II) Prof. Swift

Quiz 2, Techniques of Integration

Name: _____

key

Evaluate the integrals, or follow the instructions. You may work with other students, but you may not consult notes or the internet. You may not use calculators, tablets, or other electronic devices. The quiz is worth 5 class points, and each problem has equal weight. You may leave the class after you turn in your quiz.

$$1. \int_0^2 3x^2 dx = x^3 \Big|_0^2 = 2^3 - 0^3 = \boxed{8}$$

$$2. \int x e^x dx = x e^x - \int e^x dx = \boxed{x e^x - e^x + C}$$

Parts: $u = x, dv = e^x dx$
 $du = dx, v = e^x$

$$3. \int \cos^3(x) dx = \int \underline{\cos^2(x)} \underline{\cos(x)} dx = \int \underline{1-u^2} \underline{du} = u - \frac{u^3}{3} + C = \dots$$

let $u = \sin(x)$

$$du = \cos(x) dx$$

$$\underline{\cos^2(x)} = 1 - \sin^2 x = \underline{1-u^2}$$

$$= \sin(x) - \frac{\sin^3(x)}{3} + C$$

4. Use a trig substitution to write as $\int f(\theta) d\theta$, but do not evaluate the new integral.

$$\int \sqrt{x^2-1} dx = \int \tan(\theta) \frac{\sin(\theta)}{\cos^2(\theta)} d\theta$$

using the 2 boxes below.

Sides: $1, x, \sqrt{x^2-1}$

(Sides)²: $1, x^2, x^2-1$



Pic. says $\cos(\theta) = \frac{1}{x}$, so

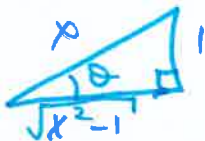
$$x = \frac{1}{\cos(\theta)}$$

Pic says

$$\tan \theta = \sqrt{x^2-1}$$

$$\text{so } dx = \frac{0 - (-\sin \theta)}{\cos^2(\theta)} d\theta$$

Note: this works too:



$$dx = \frac{\sin(\theta)}{\cos^2(\theta)} d\theta$$