

# KEY

## Math 126: Quiz 2

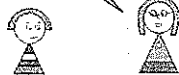
September 21, 2012

You have the remainder of the hour to complete this closed-book, closed-notes, closed-colleague quiz. NO CALCULATORS on this quiz. PLEASE READ ALL DIRECTIONS CAREFULLY!

Are you tired of adding C? spike@math.com  
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$$\int 4x^3 dx = x^4 + C$$

Don't forget the +C!



Then try these awesome alternatives!

Why use C when you can define P to be your constant.

$$\int 4x^3 dx = x^4 + P, \text{ where } P \text{ is an arbitrary constant.}$$

Subtract C instead.

$$\int 4x^3 dx = x^4 - C$$

Add C. Then add 42.

$$\int 4x^3 dx = x^4 + C + 42$$

Add any function of C whose range is all real numbers.

$$\int 4x^3 dx = x^4 + \tan(C), \text{ where } C \in (-\pi/2, \pi/2).$$

Add monkey.

$$\int 4x^3 dx = x^4 + \text{monkey}$$

Bonus points for drawing a monkey!

$$\int 4x^3 dx = x^4 + \text{🐵}$$

where 🐵 is an arbitrary constant.



That's not the answer in the teacher's guide!!

1.

$$\int \frac{dx}{\sqrt{9-4x^2}}$$

Trig Sub:

$$2x = 3 \sin \theta$$

$$x = \frac{3}{2} \sin \theta$$

$$dx = \frac{3}{2} \cos \theta d\theta$$

$$= \int \frac{\frac{3}{2} \cos \theta d\theta}{\sqrt{9-9\sin^2 \theta}}$$

$$= \frac{1}{2} \int \frac{\cos \theta}{\sqrt{1-\sin^2 \theta}} d\theta$$

$$= \frac{1}{2} \int d\theta = \frac{1}{2} \theta$$

$$= \frac{1}{2} \arcsin \frac{2x}{3} + C$$

2.

$$\int \cos^2(3x) dx$$

$$\int \cos^2(3x) dx = \int \frac{1 + \cos 6x}{2} dx$$

$$= \frac{1}{2} x + \frac{\sin 6x}{12} + C$$

3.

$$\int t \sin(2t) dt$$

$$\text{IBP: } u = t \quad dv = \sin 2t dt$$

$$du = dt \quad v = \frac{-\cos 2t}{2}$$

$$\int t \sin 2t dt = \frac{-t \cos 2t}{2} - \int \frac{-\cos 2t}{2} dt$$

$$= \frac{-t \cos 2t}{2} + \frac{\sin 2t}{4} + C$$

$$u = 2t$$

$$du = 2dt$$

$$\frac{1}{2} \left[ \int \frac{u}{2} \sin u du \right]$$

4.

$$\int e^x \sqrt{1+e^x} dx$$

$$u = 1+e^x \rightarrow \int \sqrt{u} du = \frac{2}{3} u^{3/2} + C$$

$$du = e^x dx$$

$$= \frac{2}{3} (1+e^x)^{3/2} + C$$

5.

$$\int \sec^3 x \tan x \, dx$$

$$\begin{aligned} &= \int \sec^2 x \sec x \tan x \, dx \\ &\left. \begin{aligned} u &= \sec x \\ du &= \sec x \tan x \, dx \end{aligned} \right\} \\ &\int u^2 \, du = \frac{u^3}{3} + C \\ &= \frac{\sec^3 x}{3} + C \end{aligned}$$

6. Bonus: You may have half a point extra credit, or 1.5 points extra credit. Which do you choose. Note: If more than one-quarter of you take 1.5 points, no one gets any EC.