

## 212 Quiz #2 Solutions

By: Sauna, the person sitting next to Corey on the airplane

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*Hello, kids. This is Sauna, and I'm sitting next to Corey on the airplane whilst he travels to a math conference. My name is unique...I explained to Corey that my real name is Cassandra, but when I was born, my older brother couldn't really pronounce "Cassandra", so he just said "Sauna". And it stuck. I had the unfortunate experience of sitting next to Corey while he told me about how he lost his favorite polar fleece. I told him that he just needs to move on so that he doesn't end up on Dr. Phil. Corey agrees, but maintains he's not giving up hope until he checks the lost and found at the Ontario airport when he returns. All the same, I have listed for you all the grade breakdown for the quiz, and have typed out the solutions to the quiz for your convenience.*

Score	Number of People who Scored that
45-∞	4
40-44	8
35-39	1
30-34	0
-∞ - 29	3

1. This first one is just an application of the 2nd fundamental theorem of calculus. Remember, that all you're ever doing is applying to chain rule:

$$\begin{aligned}\frac{d}{dx} \left[ \int_0^{\arctan x} \sqrt{t^2 + 1} dt \right] &= \sqrt{(\arctan x)^2 + 1} \frac{d}{dx} \arctan x \\ &= \sqrt{(\arctan x)^2 + 1} \cdot \frac{1}{x^2+1}.\end{aligned}$$

2. One could do this problem in one of two ways. The first would be to recall that  $\arcsin x + \arccos x = \frac{\pi}{2}$ . Then  $\frac{d}{dx} [\arcsin x + \arccos x] = 0$ . On the other hand, doing it directly would give you

$$\begin{aligned}\frac{d}{dx} [\arcsin x + \arccos x] &= \frac{d}{dx} \arcsin x + \frac{d}{dx} \arccos x \\ &= \frac{1}{\sqrt{1-x^2}} + \frac{-1}{\sqrt{1-x^2}} = 0.\end{aligned}$$

3. Let  $u = 1 - e^x$ . Then  $du = -e^x dx$ , or  $-du = e^x dx$ . So:

$$\begin{aligned}\int e^x \sqrt{1 - e^x} dx &= \int \sqrt{u}(-du) \\ &= (-1) \frac{1}{3/2} u^{3/2} + C \\ &= \frac{-2}{3} (1 - e^x)^{3/2} + C.\end{aligned}$$

4. Several people screwed up the factoring in the denominator (a somewhat minor mistake), so I carefully type out that part as well:

$$\begin{aligned}\sqrt{4 - x^2} &= \sqrt{4(1 - \frac{x^2}{4})} \\ &= \sqrt{4} \sqrt{1 - (\frac{x}{2})^2} \\ &= 2\sqrt{1 - (\frac{x}{2})^2}.\end{aligned}$$

We now let  $u = \frac{x}{2}$ . Then  $du = \frac{1}{2} dx$ , or  $dx = 2du$ . So:

$$\begin{aligned}\int \frac{1}{\sqrt{4-x^2}} dx &= \int \frac{1}{2\sqrt{1-(\frac{x}{2})^2}} dx \\ &= \frac{2}{2} \int \frac{1}{\sqrt{1-u^2}} du \\ &= \arcsin u + C = \arcsin \frac{x}{2} + C.\end{aligned}$$

5. Let  $u = x^3$ . Then  $du = 3x^2 dx$ . So we have:

$$\begin{aligned}\int \frac{3x^2}{1+x^6} dx &= \int \frac{du}{1+u^2} \\ &= \arctan(u) + C \\ &= \arctan(x^3) + C.\end{aligned}$$

I hope these solutions help. Be sure to study hard for the exam, there will be a lot of similar problems there. Be sure to, though, at all times:

**ROCK ON!!!**