

Math 2300-007: Quiz 1

Name: Solutions 1/19/18

Score: _____

1. (6 points) Evaluate the following

(a) $\frac{d}{dx} \csc(x) = -\csc x \cot x$

(d) $\int 3^x + x^2 dx = \frac{3^x}{\ln(3)} + \frac{1}{3}x^3 + C$

(b) $\int \frac{1}{1+t^2} dt = \arctan t + C$

(e) $\ln(1) = 0$

(c) $\cos\left(\frac{7\pi}{6}\right) = -\frac{\sqrt{3}}{2}$



(f) $\frac{d}{d\theta} \sqrt{\sin(3\theta)} = \frac{d}{d\theta} [\sin(3\theta)^{1/2}]$
 $= \frac{1}{2} \sin(3\theta)^{-1/2} \cdot \frac{d}{d\theta} \sin(3\theta)$
 $= \frac{1}{2} \sin(3\theta)^{-1/2} \cdot \cos(3\theta) \cdot \frac{d}{d\theta} (3\theta)$

2. (1 point) u/du -substitution is a technique for finding antiderivatives that is most closely related to which rule for finding derivatives?

The Chain Rule

$$= \frac{1}{2\sqrt{\sin(3\theta)}} \cdot \cos(3\theta) \cdot 3$$

$$= \frac{3 \cos(3\theta)}{2\sqrt{\sin(3\theta)}}$$

3. (3 points) Evaluate the following integral. (Hint: Consider that $\sin^2(x) + \cos^2(x) = 1$.)

$$\begin{aligned} \int \cos^3(x) \sin^2(x) dx &= \int \cos^2 x \sin^2 x \cdot \cos x dx \\ &= \int (1 - \sin^2 x) \sin^2 x \cdot \underbrace{\cos x dx}_{du} \\ &= \int (1 - u^2) u^2 du \\ &= \int u^2 - u^4 du \\ &= \frac{1}{3} u^3 - \frac{1}{5} u^5 + C \\ &= \frac{1}{3} \sin^3 x - \frac{1}{5} \cos^5 x + C \end{aligned}$$

$$\left\{ \begin{array}{l} u = \sin x \\ du = \cos x dx \end{array} \right\}$$