Worksheet 1

Spring 2016

MATH 222, Week 1: I.1,I.3,I.5

Name: _____

Problem 1. Use the identity $sin^2(\theta) + \cos^2(\theta) = 1$ to show that $\tan^2(\theta) + 1 = \sec^2(\theta)$.

Problem 2. (a) Circle the correct answer:

$$2\sin(\theta)\cos(\theta) = \qquad \sin(2\theta) \qquad \cos(2\theta)$$

$$\cos^2(\theta) - \sin^2(\theta) = \qquad \sin(2\theta) \qquad \cos(2\theta)$$

(b) Using the previous part and other trig identities, prove the following half angle formulas:

(a) $cos^2(\theta) = \frac{1}{2}(cos(2\theta) + 1)$. There's a very similar identity for $\sin^2(\theta)$ that could be useful later on.

(b) $\tan(2\theta) = \frac{2\tan(\theta)}{1-\tan^2(\theta)}$

Problem 3. True of False. In either case, briefly explain why.

(a) $\frac{d}{dx}(\ln(x^2)) = \frac{2}{x^2}$

(b) $\frac{d}{dz}\int_0^z \frac{dy}{4-y^2} = \frac{1}{4-z^2}$

(c) $\sqrt{x^4+36} = x^2+6$

(d) $\int e^x dx = e^x$

(e) $\int \ln(x) dx = \frac{1}{x} + C$

Problem 4. Compute $\int \ln(x)\, dx$ (Slight hint for part (e) of the last problem).

Problem 5. Compute $\int \arcsin(3x)\, dx$.

Problem 6. Let a be any fixed real constant. Compute $\frac{d}{dx}\int_{x^3}^a \ln(t)\, dt$. (Hint: Fundamental Theorem of Calc).

Problem 7. Compute $\int \sin^2(\theta)\cos^2(\theta)\, d\theta$. There are at least two ways to approach this.