Worksheet 1

Fall 2018

MATH 222, Week 1: Review

Name: ________________________________

1 Trig Identity Review

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:

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

(b) Using part (a) and $\sin^2(\theta) + \cos^2(\theta) = 1$, 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) $\tan(2\theta) = \frac{2\tan(\theta)}{1-\tan^2(\theta)}$

2 Integration and Fundamental Theorem of Calculus Review

Problem 3. For each of the following, state whether the object is a function or a number. If it is a function, state what variable it is a function of.

(a) $\int_e^x e^{\sec^2(\ln(t))} dt$

(b) $\int \arcsin(x) dx$

(c) $\int_1^3 \arctan(s) ds$

(d) $\int_0^{\pi t} \arccos(x) dx$

(e) $\int_x^{x^2} \cos^3(t) \sin^2(t)\, dt$

(f) $\int_t^t f(x)\, dx$

Problem 4. Compute $\int_0^x (\int_0^t \cos(s) ds) dt$.

Problem 5. Define $f(x) = \int_x^{x^2} e^{t^3} dt$. Compute $f'(x)$. Hint: Split the integral into $\int_x^1$ and $\int_1^{x^2}$ and use the Fundamental Theorem of Calculus.

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

3 Challenge Problem

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