Math 120: Midterm 3 Formulas

Trig Rules:

1. $\sin^2 x + \cos^2 x = 1$
2. $\sec^2 x - \tan^2 x = 1$
3. $\sin^2 x = \frac{1}{2}(1 - \cos(2x))$
4. $\cos^2 x = \frac{1}{2}(1 + \cos(2x))$
5. $\sin x \cos x = \frac{1}{2}\sin(2x)$

Trig integrals:

1. $\int \sin x \ dx = -\cos x + C$
2. $\int \cos x \ dx = \sin x + C$
3. $\int \tan x \ dx = -\ln|\cos x| + C$
4. $\int \sec x \ dx = \ln|\sec x + \tan x| + C$
5. $\int \cot x \ dx = \ln|\sin x| + C$
6. $\int \csc x \ dx = \ln|\csc x - \cot x| + C$
7. $\int \sec^2 x \ dx = \tan x + C$
8. $\int \csc^2 x \ dx = -\cot x + C$
9. $\int \sec x \tan x \ dx = \sec x + C$
10. $\int \csc x \cot x \ dx = -\csc x + C$

Inverse trig derivatives:

1. $\frac{d}{dx}\left(\sin^{-1}(x)\right) = \frac{1}{\sqrt{1-x^2}}$
2. $\frac{d}{dx}\left(\cos^{-1}(x)\right) = -\frac{1}{\sqrt{1-x^2}}$
3. $\frac{d}{dx}\left(\tan^{-1}(x)\right) = \frac{1}{1+x^2}$
4. $\frac{d}{dx}\left(\csc^{-1}(x)\right) = -\frac{1}{x\sqrt{x^2-1}}$
5. $\frac{d}{dx}\left(\sec^{-1}(x)\right) = \frac{1}{x\sqrt{x^2-1}}$
6. $\frac{d}{dx}\left(\cot^{-1}(x)\right) = -\frac{1}{1+x^2}$

Exponential integrals:

1. $\int b^x \ dx = \frac{b^x}{\ln b} + C$
2. $\int e^{kx} \ dx = \frac{e^{kx}}{k} + C$

A few sums:

1. $\sum_{i=1}^{n} i = \frac{(n+1)n}{2}$
2. $\sum_{i=1}^{n} i^2 = \frac{(2n+1)(n+1)n}{6}$
3. $\sum_{i=1}^{n} i^3 = \left(\frac{(n+1)n}{2}\right)^2$