

## Formula sheet for Midterm 1

### Trigonometric Identities

$$\sin^2 x + \cos^2 x = 1$$

$$1 + \tan^2 x = \sec^2 x$$

$$\cos^2 x = \frac{1}{2} + \frac{1}{2} \cos 2x$$

$$\sin^2 x = \frac{1}{2} - \frac{1}{2} \cos 2x$$

$$\sin 2x = 2 \cos x \sin x$$

$$\sin A \cos B = \frac{1}{2} [\sin(A - B) + \sin(A + B)]$$

$$\sin A \sin B = \frac{1}{2} [\cos(A - B) - \cos(A + B)]$$

$$\cos A \cos B = \frac{1}{2} [\cos(A - B) + \cos(A + B)]$$

### Indefinite Integrals

$$\int \tan x \, dx = \ln |\sec x| + C$$

$$\int \sec x \, dx = \ln |\sec x + \tan x| + C$$

$$\int \sec x \tan x \, dx = \sec x + C$$

$$\int \sec^2 x \, dx = \tan x + C$$

$$\int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1} \left( \frac{x}{a} \right) + C, \quad a > 0 \text{ constant}$$

$$\int \frac{dx}{a^2 + x^2} = \frac{1}{a} \tan^{-1} \left( \frac{x}{a} \right) + C, \quad a > 0 \text{ constant}$$

$$\int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a} \sec^{-1} \left( \frac{|x|}{a} \right) + C, \quad a > 0 \text{ constant}$$

### Reduction formulae

$$\int \sin^n x \, dx = -\frac{1}{n} \sin^{n-1} x \cos x + \frac{n-1}{n} \int \sin^{n-2} x \, dx$$

$$\int \cos^n x \, dx = \frac{1}{n} \cos^{n-1} x \sin x + \frac{n-1}{n} \int \cos^{n-2} x \, dx$$

$$\int \tan^n x \, dx = \frac{1}{n-1} \tan^{n-1} x - \int \tan^{n-2} x \, dx$$

$$\int \sec^n x \, dx = \frac{1}{n-1} \sec^{n-2} x \tan x + \frac{n-2}{n-1} \int \sec^{n-2} x \, dx$$