

EMTH118 FORMULA SHEET

TRIGONOMETRY

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\sin C + \sin D = 2 \sin \left(\frac{C+D}{2} \right) \cos \left(\frac{C-D}{2} \right)$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\sin C - \sin D = 2 \cos \left(\frac{C+D}{2} \right) \sin \left(\frac{C-D}{2} \right)$$

$$2 \sin A \cos B = \sin(A+B) + \sin(A-B)$$

$$\cos C + \cos D = 2 \cos \left(\frac{C+D}{2} \right) \cos \left(\frac{C-D}{2} \right)$$

$$2 \cos A \cos B = \cos(A+B) + \cos(A-B)$$

$$\cos C - \cos D = 2 \sin \left(\frac{C+D}{2} \right) \sin \left(\frac{D-C}{2} \right)$$

$$2 \sin A \sin B = \cos(A-B) - \cos(A+B)$$

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

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

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

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

$$\cot^2 x + 1 = \csc^2 x$$

DERIVATIVES

INTEGRALS

$$f(x) \quad f'(x)$$

$$f(x) \quad \int f(x) dx$$

$$x^n \quad nx^{n-1}$$

$$x^n \quad \frac{x^{n+1}}{n+1}$$

$$\ln x \quad 1/x$$

$$1/x \quad \ln |x| + C$$

$$e^x \quad e^x$$

$$\frac{1}{\sqrt{1-x^2}} \quad \sin^{-1}(x) + C$$

$$\sin x \quad \cos x$$

$$\frac{1}{1+x^2} \quad \tan^{-1}(x) + C$$

$$\cos x \quad -\sin x$$

$$\text{Integration by parts} \quad \int u dv = uv - \int v du$$

$$\tan x \quad \sec^2 x$$

DIFFERENTIATION RULES

$$\csc x \quad -\csc x \cot x$$

$$(uv)' = u'v + uv'$$

$$\sec x \quad \sec x \tan x$$

$$\left(\frac{u}{v} \right)' = \frac{u'v - uv'}{v^2}$$

$$\cot x \quad -\csc^2 x$$

QUADRATIC FORMULA

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

VECTORS

$$\mathbf{x} \cdot \mathbf{y} = x_1 y_1 + x_2 y_2 + \dots + x_n y_n$$

$$\cos \theta = \frac{\mathbf{x} \cdot \mathbf{y}}{\|\mathbf{x}\| \|\mathbf{y}\|}$$

$$\|\mathbf{x}\| = \sqrt{x_1^2 + x_2^2 + \dots + x_n^2}$$

$$\text{Proj}_{\mathbf{d}} \mathbf{x} = \left(\frac{\mathbf{x} \cdot \mathbf{d}}{\|\mathbf{d}\|^2} \right) \mathbf{d}$$

$$\mathbf{x} \times \mathbf{y} = (x_2 y_3 - x_3 y_2, -(x_1 y_3 - x_3 y_1), x_1 y_2 - x_2 y_1)$$