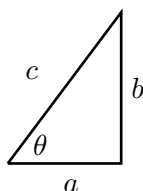# 1 Trigonometric formula

Pythagorean thm:
$$\sin^2\theta + \cos^2\theta = 1, \quad \tan^2\theta + 1 = \sec^2\theta$$

Double angle formulas:
$$\sin^2\theta = \frac{1 - \cos 2\theta}{2}, \quad \cos^2\theta = \frac{1 + \cos 2\theta}{2}, \quad 2\sin\theta\,\cos\theta = \sin 2\theta$$

Right triangle relations:
$$\tan\theta = \frac{\sin\theta}{\cos\theta}, \quad \sec\theta = \frac{1}{\cos\theta}$$

opposite $= a$, adjacent $= b$, hypotenuse $= c$, $a^2 + b^2 = c^2$

$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{a}{c}$, $\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}} = \frac{b}{c}$

$\tan\theta = \frac{\text{opposite}}{\text{adjacent}} = \frac{a}{b}$, $\sec\theta = \frac{\text{hypotenuse}}{\text{adjacent}} = \frac{c}{b}$

2 Trigonometric Differentiation/Integration

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$$(\sin\theta)' = \cos\theta, \qquad \int \cos\theta\, d\theta = \sin\theta + C$$

$$(\sin(a\theta + b))' = a\cos(a\theta + b), \qquad \int \cos(a\theta + b)\, d\theta = \frac{1}{a}\sin(a\theta + b) + C$$

$$(\cos\theta)' = -\sin\theta, \qquad \int \sin\theta\, d\theta = -\cos\theta + C$$

$$(\cos(a\theta + b))' = -a\sin(a\theta + b), \qquad \int \sin(a\theta + b)\, d\theta = -\frac{1}{a}\cos(a\theta + b) + C$$

- $(\tan\theta)' = \sec^2\theta,$ $\int \sec^2\theta\, d\theta = \tan\theta + C,$ $(\tan a\theta)' = a\sec^2 a\theta$
  $(\sec\theta)' = \tan\theta\sec\theta,$ $\int \tan\theta\sec\theta\, d\theta = \sec\theta + C,$ $(\sec a\theta)' = a\tan a\theta\sec a\theta$

3 Some Other hard formulas

- $\cot\theta = \frac{\cos\theta}{\sin\theta}, \quad \csc\theta = \frac{1}{\sin\theta}, \quad (\cot\theta)' = -\csc^2\theta, \quad \int \csc^2\theta\, d\theta = -cot\theta + C$

- $\int \tan\theta\, d\theta = \ln|\sec\theta| + C = -\ln|\cos\theta| + C, \quad \int \sec\theta\, d\theta = \ln|\sec\theta + \tan\theta| + C$