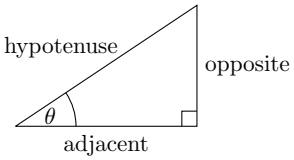
Trig Identities

Main Topic # 1: [Basic Trig Identities]

Basic Trig

Basics



$$\cos(\theta) = \frac{\text{adj}}{\text{hyp}} \quad \sin(\theta) = \frac{\text{opp}}{\text{hyp}} \quad \tan(\theta) = \frac{\text{opp}}{\text{adj}}$$

$$\tan(\theta) = \frac{\sin(\theta)}{\cos(\theta)} \quad \sec(\theta) = \frac{1}{\cos(\theta)}$$

$$\csc(\theta) = \frac{1}{\sin(\theta)} \quad \cot(\theta) = \frac{\cos(\theta)}{\sin(\theta)}$$

Trig Identities useful in Integration

Pythagorean Identity: $\sin^2(\theta) + \cos^2(\theta) = 1$

Half-Angle Formulas: $\cos^2 x = \frac{1 + \cos(2x)}{2}$ $\sin^2 x = \frac{1 - \cos(2x)}{2}$

Double-Angle Formulas: $\cos(2x) = \cos^2 x - \sin^2 x$ $\sin(2x) = 2\sin x\ \cos x$

Add./Subst. Formulas:
$$\cos(s+t) = \cos s\ \cos t - \sin s\ \sin t$$
$$\sin(s+t) = \sin s\ \cos t + \cos s\ \sin t$$
$$\cos(s-t) = \cos s\ \cos t + \sin s\ \sin t$$
$$\sin(s-t) = \sin s\ \cos t - \cos s\ \sin t$$

Problem 1. Simplify each expression to a single trig function or number

1. $\sec(\theta)\sin(\theta)$
2. $\cos(\theta)\sin(\theta)$
3. $\tan^2(\theta) - \sec^2(\theta)$
4. $1 - \cos^2(\theta)$

Problem 2. Simplify each expression to a single trig function or number

1. $\Big(1-\cos(\theta)\Big)\Big(1+\cos(\theta)\Big)$
2. $\Big(\sec(\theta)-1\Big)\Big(\sec(\theta)+1\Big)$
3. $\dfrac{1}{\sin^2(\theta)}-\dfrac{1}{\tan^2(\theta)}$
4. $1-\dfrac{\sin^2(\theta)}{\tan^2(\theta)}$
5. $\dfrac{1}{\cos^2(\theta)}-\dfrac{1}{\cot^2(\theta)}$
6. $\cos(\theta)\Big(\sec(\theta)-\cos(\theta)\Big)$
7. $\cos^2(\theta)\Big(\sec^2(\theta)-1)$
8. $\Big(1-\cos(\theta)\Big)\Big(1+\sec(\theta)\Big)\cos(\theta)$
9. $\dfrac{\sin(\theta)\cos(\theta)}{1-\cos^2(\theta)}$
10. $\dfrac{\tan^2(\theta)}{\sec^2(\theta)}+1$