

Part 4: Factoring

$$\text{Ex 5) } \frac{\sec x \csc x}{-\csc x} = \frac{\csc x}{-\csc x}$$

$$\sec x \csc x - \csc x = 0$$

$$\csc x (\sec x - 1) = 0$$

$$\begin{aligned} \downarrow \\ \csc x = 0 \\ \sin x = \text{undefined} \\ \emptyset \end{aligned}$$

$$\sec x - 1 = 0$$

$$\sec x = 1$$

$$\cos x = 1$$

$$\boxed{x = 0 \text{ radians}}$$

$$\text{You try: } \frac{\sin^2 x \cos x}{-\cos x} = \frac{\cos x}{-\cos x}$$

$$\sin^2 x \cos x - \cos x = 0$$

$$\cos x (\sin^2 x - 1) = 0$$

$$\downarrow \\ \cos x = 0$$

$$\downarrow \\ \sin^2 x - 1 = 0 \\ \sqrt{\sin^2 x} = \sqrt{1}$$

$$\sin x = \pm 1$$

$$\boxed{x = \frac{\pi}{2}, \frac{3\pi}{2}}$$

Factoring Cont'd

Ex 6) $2\sin^2 x - \sin x - 1 = 0$

$$2x^2 - x - 1 = 0$$

$$2x^2 - 2x + x - 1 = 0$$

$$2x(x-1) + 1(x-1) = 0$$

$$(2x+1)(x-1) = 0$$

$$\begin{array}{r|l} x(-2) & +(-1) \\ -2, 1 & -2+1 \end{array}$$

$$(2\sin x + 1)(\sin x - 1) = 0$$

$$2\sin x + 1 = 0$$

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

$$\sin x - 1 = 0$$

$$\sin x = 1$$

$$x = \frac{7\pi}{6}, \frac{11\pi}{6}, \frac{\pi}{2}$$

You try: $4\cos^2 \theta + 4\cos \theta = -1$

$$4\cos^2 \theta + 4\cos \theta + 1 = 0$$

$$4\cos^2 \theta + 2\cos \theta + 2\cos \theta + 1 = 0$$

$$2\cos \theta(2\cos \theta + 1) + 1(2\cos \theta + 1) = 0$$

$$(2\cos \theta + 1)(2\cos \theta + 1) = 0$$

$$2\cos \theta + 1 = 0$$

$$\cos \theta = -\frac{1}{2}$$

$$\theta = \frac{2\pi}{3}, \frac{4\pi}{3}$$

$$\begin{array}{r|l} x(4) & +4 \\ 2^2 & \end{array}$$

Rewrite As a Single Trig
Function

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

Ex 7) $\sin^2 x = 2 \cos x + 2$

$$\begin{array}{r} \boxed{1 - \cos^2 x} = 2 \cos x + 2 \\ \begin{array}{ccc} -1 + \cos^2 x & + \cos^2 x & -1 \end{array} \end{array}$$

$$0 = \cos^2 x + 2 \cos x + 1$$

$$(\cos x + 1)(\cos x + 1) = 0$$

$$\cos x = -1$$

$$\boxed{x = \pi}$$

Functions of Multiple Angles not in
the interval $[0, 2\pi)$

Ex 8) $\sin 3x + 1 = 0$

$$\sin 3x = -1$$

$$\left(\frac{1}{3}\right) 3x = \frac{3\pi}{2} \left(\frac{1}{3}\right)$$

$$\boxed{x = \frac{\pi}{2}}$$

You Try: $3 \tan\left(\frac{x}{2}\right) + 3 = 0$

$$\tan\left(\frac{x}{2}\right) = \frac{-3}{3}$$

$$\tan\left(\frac{x}{2}\right) = -1$$

$$\left(\frac{2}{1}\right) \frac{x}{2} = \left(\frac{2}{1}\right) \frac{3\pi}{4}, \frac{7\pi}{4} \left(\frac{2}{1}\right)$$

$$x = \frac{6\pi}{4}, \frac{14\pi}{4}$$

$$x = \frac{3\pi}{2}, \frac{7\pi}{2}$$

Reduce
 $\div 2$