

Factor each of the trigonometric expressions **completely**.

1. $2 \cos^2 x + 2 \cos x - 24$ $2x^2 + 2x - 24$
 $2(x^2 + x - 12)$
 $2(x+4)(x-3)$
 $2(\cos x + 4)(\cos x - 3)$

2. $\sin^2 x - \sin x - 2$ $x^2 - x - 2 \Rightarrow (x-2)(x+1)$
 $(\sin x - 2)(\sin x + 1)$

3. $2 \sin^2 x - 7 \sin x + 3$ $2x^2 - 7x + 3$
 $2x^2 - 6x - 1x + 3$
 $2x(x-3) - 1(x-3)$
 $(2x-1)(x-3)$
 $(2 \sin x - 1)(\sin x - 3)$

4. $\csc^2 x + 3 \csc x - 4$ $x^2 + 3x - 4 \Rightarrow (x+4)(x-1)$
 $(\csc x + 4)(\csc x - 1)$

5. $2 \cos^2 x - 5 \cos x + 2$ $2x^2 - 5x + 2$
 $2x^2 - 4x - 1x + 2$
 $2x(x-2) - 1(x-2)$
 $(2x-1)(x-2)$
 $(2 \cos x - 1)(\cos x - 2)$

6. $3 \tan^2 x + 4 \tan x - 4$ $3x^2 + 4x - 4$
 $3x^2 + 6x - 2x - 4$
 $3x(x+2) - 2(x+2)$
 $(3x-2)(x+2)$
 $(3 \tan x - 2)(\tan x + 2)$

7. $\cot^2 x - 9$
 $(\cot x - 3)(\cot x + 3)$

8. $4 \cos^2 x - 1$
 $(2 \cos x - 1)(2 \cos x + 1)$

9. $\tan^2 x + \tan x - 6$ $x^2 + x - 6$
 $(\tan x + 3)(\tan x - 2)$

10. $\sec^2 x - 1$
 $(\sec x - 1)(\sec x + 1)$

11. $\csc^2 x - 5 \csc x$ GCF of $\csc x$

$$\boxed{\csc x (\csc x - 5)}$$

13. $\sec^2 x + 5 \tan x + 5$

$$\tan^2 x + 1 + \tan x + 5$$

$$\tan^2 x + 5 \tan x + 6$$

$$\boxed{(\tan x + 3)(\tan x + 2)}$$

$x^2 + 5x + 6$
 $(x+3)(x+2)$

12. Rewrite in terms of $\cos^2 x$

$$2 \sin^2 x + 3 \cos x - 3$$

$$2(1 - \cos^2 x) + 3 \cos x - 3$$

$$2 - 2 \cos^2 x + 3 \cos x - 3$$

$$-2 \cos^2 x + 3 \cos x - 1$$

$$-1(2 \cos^2 x - 3 \cos x + 1)$$

$$\boxed{-1(2 \cos x - 1)(\cos x - 1)}$$

$$2x^2 - 3x + 1$$

$$2x^2 - 2x - 1x + 1$$

$$2x(x-1) - 1(x-1)$$

$$(2x-1)(x-1)$$

14. $2 \sec^2 x - 2 \tan^2 x - 4$

Since both terms are squared, you can rewrite either

$$2(\tan^2 x + 1) - 2 \tan^2 x - 4$$

$$2 \tan^2 x + 2 - 2 \tan^2 x - 4$$

$$\begin{aligned} &2 - 4 \\ &= \boxed{-2} \end{aligned}$$

Answer Key:

1) $2(\cos x + 4)(\cos x - 3)$

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

3) $(2 \sin x - 1)(\sin x - 3)$

4) $(\csc x + 4)(\csc x - 1)$

5) $(2 \cos x - 1)(\cos x - 2)$

6) $(3 \tan x - 2)(\tan x + 2)$

7) $(\cot x - 3)(\cot x + 3)$

8) $(2 \cos x - 1)(2 \cos x + 1)$

9) $(\tan x + 3)(\tan x - 2)$

10) $(\sec x + 1)(\sec x - 1)$

11) $\csc x(\csc x - 5)$

12) $-1(2 \cos x - 1)(\cos x - 1)$

13) $(\tan x + 3)(\tan x + 2)$

14) -2