

Trigonometric Substitution

While working in a group make sure you:

- Expect to make mistakes but be sure to reflect/learn from them!
- Are civil and are aware of your impact on others.
- Assume and engage with the strongest argument while assuming best intent.

1. Let $x = 3 \sin(\theta)$. Find the following in terms of x .

$\sin(\theta)$

θ

$\cos(\theta)$

2. Let $x = 2 \tan(\theta)$. Find the following in terms of x .

$\tan(\theta)$

$\cos(\theta)$

$\sec(\theta)$

3. Let $2x = 3 \tan(\theta)$. Find the following in terms of x .

$\tan(\theta)$

$\cos(\theta)$

θ

Expression	Substitution	Restrictions	Reason
$\sqrt{a^2 - x^2}$	$x = a \sin(\theta)$ OR $x = a \cos(\theta)$	$\frac{-\pi}{2} \leq \theta \leq \frac{\pi}{2}$ $0 \leq \theta \leq \pi$	$1 - \sin^2(\theta) = \cos^2(\theta)$ $1 - \cos^2(\theta) = \sin^2(\theta)$
$\sqrt{a^2 + x^2}$	$x = a \tan(\theta)$	$\frac{-\pi}{2} \leq \theta \leq \frac{\pi}{2}$	$1 + \tan^2(\theta) = \sec^2(\theta)$
$\sqrt{x^2 - a^2}$	$x = a \sec(\theta)$	$0 \leq \theta \leq \pi$	$\sec^2(\theta) - 1 = \tan^2(\theta)$

4. Find $\int \frac{x}{(4x^2 + 9)^{\frac{3}{2}}} dy$