

Problem Set 17

1. Perform each of the following operations on the complex numbers as indicated.

(a) $(3 + 2i)(3 - 2i) =$

(b) $\frac{3 - 4i}{2 + i} =$

(c) $(1 - i)^2 =$

(d) $(1 - i)^3 =$

(e) $(1 - i)^4 =$

(f) $(1 - i)^2 - (1 - i)^4 =$

2. Find the exact value of each of the following.

(a) $\cos\left(-\frac{7\pi}{4}\right) - 2\sin\frac{3\pi}{4} =$

(b) $\frac{\tan\frac{\pi}{24} + \tan\frac{\pi}{8}}{1 - \left(\tan\frac{\pi}{24}\right)\left(\tan\frac{\pi}{8}\right)} =$

(c) $\sin 105^\circ =$

3. Suppose that $\tan x = \frac{8}{15}$ and $\pi < x < \frac{3\pi}{2}$. Find the exact values for

(a) $\sin\frac{x}{2} =$

(b) $\cos 2x =$

4. Find the exact values for all solutions of each of the following equations.

(a) $2 + 3\sin x = \cos 2x$

(b) $4\tan^2 x - 3\sec^2 x = 0$

(c) $2\cos^2 x + 3\cos x + 1 = 0$

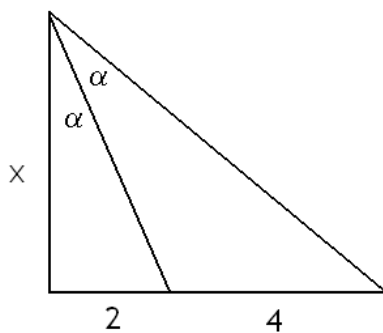
5. Prove each of the following identities.

(a) $\cos 2t = \frac{1 - \tan^2 t}{1 + \tan^2 t}$

(b) $\cot\frac{x}{2} = \frac{\sin x}{1 - \cos x}$

(c) $\sin x \cos x = \frac{1}{2}(\sin(x + y) + \sin(x - y))$

6. Find the exact values of x and α based on the picture below.



7. An object is traveling around a circle of radius 15, centered at the origin. It completes a cycle in every 14 seconds.

- (a) Find the coordinates of the object after 3 seconds if it starts at $(15, 0)$.
- (b) Find the angular velocity of the object.
- (c) Find the linear speed of the object.

8. An object is held by ropes as shown on the picture below. Find the forces in the ropes if the object weighs 100 N.

