

YOUR NAME: _____

George Voutsadakis

Read each problem **very carefully** before starting to solve it. Each problem is worth 10 points. It is necessary to show **all** your work. Correct answers without explanations are worth 0 points. GOOD LUCK!!

1. Suppose $\sin \theta = \frac{\sqrt{2}}{5}$ and $0 \leq \theta < \frac{\pi}{2}$.
 - (a) Find the exact value of $\sin\left(\frac{\theta}{2}\right)$.

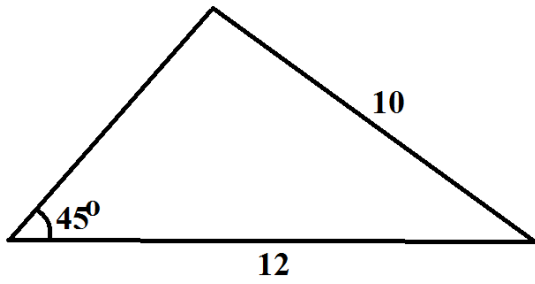
- (b) Find the exact value of $\cos(2\theta)$.

2. Solve the following equations, where $0 \leq \theta < 2\pi$.

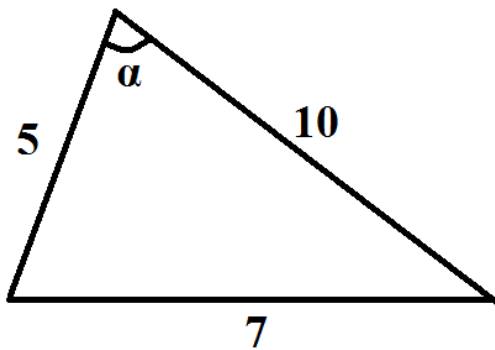
(a) $2 \sin(3\theta) + \sqrt{2} = 0$.

(b) $2 \sin^4 \theta - 3 \sin^2 \theta + 1 = 0$.

3. Solve the following triangle (i.e., find all its missing elements).



4. Given the following triangle, compute the size of its angle α in radians and calculate the size of its area in two different ways.



5. (a) Write $(25, \frac{\pi}{6})$ in rectangular coordinates (exact values).

(b) Write $(-3, 10)$ in polar coordinates (r exact and θ in radians, approximated in 2 decimal digits).

(c) Convert into polar coordinates and leave in the form $r = r(\theta)$ the Cartesian equation

$$9x^2 + 4y^2 = 36.$$