Precalculus Semester 2 Review Name: Key

Chpt. 4, 5, 7.5, 8, 9

1. Let $\tan\theta = \frac{12}{5}$, where $\sin\theta > 0$. Find the exact value of $\sin\theta$.

a. $\frac{5}{13}$

b. $\frac{5}{12}$

c. $\frac{12}{13}$

d. $\frac{13}{12}$

2. Which of the following is an equation of the tangent function with period $\frac{\pi}{4}$, phase shift π, and vertical shift 1?

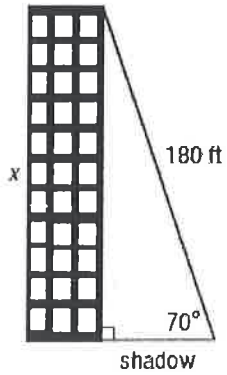
a. $y = \tan\left(4x - \frac{\pi}{4}\right) + 1$

b. $y = \tan\left(\frac{x}{4} - \pi\right) + 1$

c. $y = \tan(4x - 4\pi) + 1$

d. $y = \tan(4x + 4\pi) + 1$

3. **ARCHITECTURE** The angle of elevation from the tip of a building's shadow to the top of the building is 70° and the distance is 180 feet. Find the height of the building to the nearest foot.



a. 62 ft

b. 66 ft

c. 169 ft

d. 495 ft

4. Find the exact value of $\cos\left(\tan^{-1}\frac{4}{3}\right)$.

a. $\frac{3}{5}$

b. $\frac{5}{3}$

c. $\frac{4}{5}$

d. $\frac{5}{4}$

5. State the amplitude of $y = -2\sin(4x + \pi) + 1$.

a. 1

b. 2

c. 4

d. $-\frac{\pi}{4}$

6. Find $\arcsin\left(-\frac{\sqrt{3}}{2}\right)$, if it exists.

a. $-30°$

b. $-60°$

c. $120°$

d. does not exist

7. In $\triangle DEF$, $D = 52°$, $e = 9$, and $f = 14$. Find d.

a. 6.3

b. 8.7

c. 8.8

d. 11.0

8. Simplify $\frac{\cos\theta}{\sin\theta}$.

a. $\tan\theta$

b. $\cot\theta$

c. $\sec\theta$

d. $\csc\theta$

9. Simplify $\frac{1-\sec^2\theta}{\tan^2\theta}$.

a. $\tan^2\theta$

b. $\csc^2\theta$

c. -1

d. 1

Chapter 8 Vectors

1. Find the vertical component of v with a magnitude of 5 inches and a direction angle of 32°.

A 2.65 in. **B** 2.79 in. **C** 4.24 in. **D** 31.88 in.

2. Find a unit vector u with the same direction as $\mathbf{v} = \langle -3, 4\rangle$.

F $\left\langle -\frac{1}{5}, \frac{1}{5}\right\rangle$ **G** $\langle 8, -6\rangle$ **H** $\left\langle -\frac{3}{5}, \frac{4}{5}\right\rangle$ **J** $\left\langle \frac{3}{5}, -\frac{4}{5}\right\rangle$

4. Find the measure of the angle θ between vectors $\mathbf{a} = \langle 4, 6\rangle$ and $\mathbf{b} = \langle 2, 8\rangle$ to the nearest tenth of a degree.

F 19.7° **G** 43.3° **H** 70.4° **J** 102.3°

5. Find the component form and magnitude of $\overrightarrow{AB}$ with initial point $A(1, 2)$ and terminal point $B(0, 3)$.

A $\langle -1, 1\rangle$; 1.41 **B** $\langle 1, -1\rangle$; 2 **C** $\langle -1, -1\rangle$; 1.41 **D** $\langle 1,1\rangle$; 2

6. A force $\mathbf{F}_1$ of 9 newtons pulls due north. A force $\mathbf{F}_2$ of 12 newtons pulls due east. Find the magnitude and direction of the resultant force.

F 15 N; 36.9° **G** 15 N; 53.1° **H** 21 N; 36.9° **J** 21 N; 53.1°

For Questions 7 and 8, find each of the following for $\mathbf{v} = \langle 3, -4\rangle$, $\mathbf{w} = \langle 3, -1\rangle$, $\mathbf{r} = \langle 2, 7, -2\rangle$, and $\mathbf{s} = \langle -3, 4, 9\rangle$.

7. $2\mathbf{v} + \mathbf{w}$

A $\langle 6, -5\rangle$ **B** $\langle 6, -6\rangle$ **C** $\langle 9, -9\rangle$ **D** $\langle 9, -10\rangle$

8. $\mathbf{r} - \mathbf{s}$

F $\langle -1, 13, 7\rangle$ **G** $\langle 1, -13, -7\rangle$ **H** $\langle -5, -3, 11\rangle$ **J** $\langle 5, 3, -11\rangle$

For Questions 12 and 13, find each dot product. Then determine if the vectors are orthogonal.

12. $\langle 2, 3\rangle \cdot \langle 4, 5\rangle$

F 22, orthogonal
G 22, not orthogonal
H 23, orthogonal
J 23, not orthogonal

13. $\langle 3, 0, -2\rangle \cdot \langle 4, -2, 6\rangle$

A 0, orthogonal
B 0, not orthogonal
C 9, orthogonal
D 9, not orthogonal

15. An airplane takes off in the direction of the vector $\langle 9, 5\rangle$. What is the measure of the angle the plane makes with the horizontal?

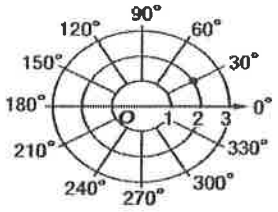
A 29.1° B 33.7° C 56.3° D 60.9°

16. A cruise ship's path is represented by the vector $\langle 9, 17\rangle$. It then follows a new path represented by the vector $\langle 12, 8\rangle$. What is the resultant path?

F $\langle 3, 9\rangle$ G $\langle 21, 25\rangle$ H $\langle -3, 9\rangle$ J $\langle -21, 25\rangle$

Chapter 9 Polar Equations

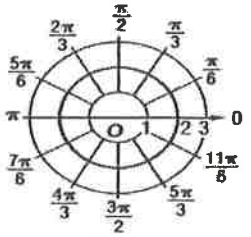
1. Find the polar coordinates that do *not* describe the point in the given graph.



A $(-2, 30°)$ **C** $(2, 30°)$

B $(-2, 210°)$ **D** $(-2, -150°)$

2. Find the equation represented in the given graph.



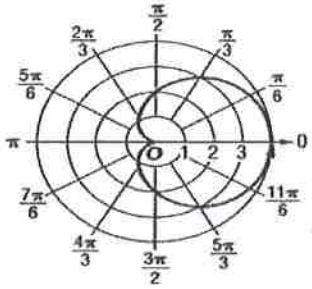
F $\theta = 3$ **H** $\theta = 2\pi$

G $r = 3$ **J** $r = 2$

3. AIRPLANES Two airplanes at the same altitude have polar coordinates $(2, 120°)$ and $(1, 45°)$, where r is in miles. Find the distance between them.

A 1.40 miles **B** 1.99 miles **C** 2.46 miles **D** 2.98 miles

4. Find the equation which is graphed at the right.



F $r = 4 \cos \theta$

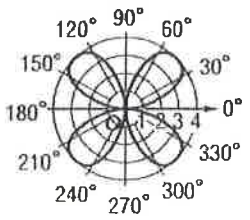
G $r = 2 - 2 \cos \theta$

H $r = 2 + 2 \cos \theta$

J $r = 2 + 2 \sin \theta$

5. Identify the graph for the polar equation $r = 4 \sin \theta$.

A



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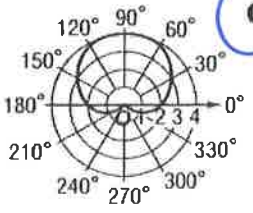

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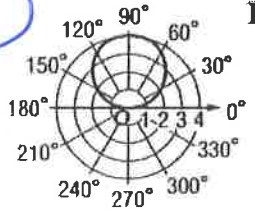
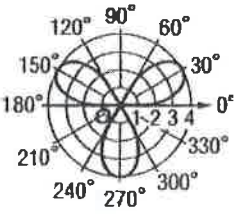


D



6. Find polar coordinates for the point with rectangular coordinates $(\sqrt{3}, 1)$ if $0 \leq \theta \leq 2\pi$ and $r \geq 0$.

F $\left(2, \frac{\pi}{3}\right)$ **G** $\left(2, \frac{\pi}{6}\right)$ **H** $\left(2, \frac{\pi}{4}\right)$ **J** $\left(1, \frac{\pi}{6}\right)$

7. ROBOT A robot's hand is positioned so its center has polar coordinates $(3, 180°)$. Find rectangular coordinates for this point.

A $(-3, 0)$ **B** $(0, 3)$ **C** $(3, 0)$ **D** $(0, -3)$

8. Write the rectangular equation $x = 3$ in polar form.

F $r = 3 \csc \theta$ **G** $r = 3$ **H** $\theta = 3$ **J** $r = 3 \sec \theta$

9. Write the polar equation $r = 3$ in rectangular form.

A $x^2 - 9 = 0$ **B** $x^2 + y^2 - 9y = 0$ **C** $x^2 + y^2 = 9$ **D** $xy = 9$

15. Express $3\sqrt{3} + 3i$ in polar form.

A $3\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$ **C** $6\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$

B $6\left(\cos\frac{\pi}{6} - i\sin\frac{\pi}{6}\right)$ **D** $6\left(\cos\frac{\pi}{6} + i\sin\frac{\pi}{6}\right)$

16. Express $2\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$ in rectangular form.

F $-1 + \sqrt{3}i$ **G** $1 + \sqrt{3}i$ **H** $1 - \sqrt{3}i$ **J** $\sqrt{3} + i$

Section 7.5 Parametric Equations

For 1 and 2 Write each pair of parametric equations in rectangular form

1. $x = 2t - 3, y = -t^2$

$+3 \quad +3$

$\frac{x+3}{2} = \frac{2t}{2}$

$\frac{x+3}{2} = t$

$y = -\left(\frac{x+3}{2}\right)^2$

$y = \frac{-x^2 - 6x - 9}{2}$

2. $x = 5\sin\theta, y = -7\cos\theta$

$\sin\theta = \frac{x}{5} \quad \cos\theta = \frac{y}{-7}$

$\left(\frac{x}{5}\right)^2 + \left(\frac{y}{-7}\right)^2 = 1$

$\frac{x^2}{25} + \frac{y^2}{49} = 1$