

Conic Sections

Multiple Choice - Choose the best answer for each question.

1. State the vertex of the parabola whose equation is $(y - 9)^2 = -4(x - 2)$.

- a. (9, -2) b. (-2, 2) c. (2, -2) **d. (2, 9)**

2. Rewrite the following equation in standard form: $2y^2 + 12y - x + 2 = 0$.

- a. $(y + 6)^2 = \frac{1}{2}(x - 2)$ b. $(y + 3)^2 = \frac{1}{2}(x + 7)$
 c. $(y + 3)^2 = \frac{1}{2}(x + 10)$ **d. $(y + 3)^2 = \frac{1}{2}(x + 16)$**

$2y^2 + 12y = x - 2$
 $2(y^2 + 6y + 9) = x - 2 + 18$
 $\frac{1}{2} \cdot 2(y + 3)^2 = x + 16 - \frac{1}{2}$
 $(y + 3)^2 = \frac{1}{2}(x + 16)$

② 3. Identify the focus of $(y - 3)^2 = -8(x - 2)$. $4p = -8 \Rightarrow p = -2$
 $P = -2$
 $V: (2, 3)$

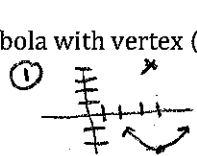
- a. **(0, 3)** b. (4, 3) c. (2, 1) d. (2, 5)

4. Identify the type of conic section from the equation: $y^2 - 4y - x^2 + 6x = 12$.

- a. Circle b. Ellipse c. Parabola **d. Hyperbola**

5. Write the equation of the parabola with vertex $(4, -2)$ and focus $(4, 4)$.

- a. $(x - 4)^2 = 16(y + 2)$ b. $(y + 2)^2 = 8(x - 4)$
c. $(x - 4)^2 = 24(y + 2)$ d. $(y + 2)^2 = 12(x - 4)$



② $(x - h)^2 = 4p(y - k)$
 $(x - 4)^2 = 4(6)(y - (-2))$
 $(x - 4)^2 = 24(y + 2)$

6. What are the center and radius of the circle, $(x - 7)^2 + (y + 6)^2 = 4$?

- a. C: (-7, 6); r = 4 b. C: (7, -6); r = 16 c. C: (-7, 6); r = 8 **d. C: (7, -6); r = 2**

7. Write the equation of the circle with a diameter with endpoints $(6, 12)$ and $(16, -8)$.

- a. $(x - 11)^2 + (y - 6)^2 = 125$ b. $(x - 11)^2 + (y + 6)^2 = 11.2$
c. $(x - 11)^2 + (y - 2)^2 = 125$ d. $(x - 11)^2 + (y - 2)^2 = 11.2$

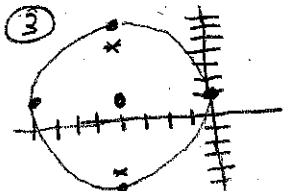
② $midpt = (\frac{6+16}{2}, \frac{12+(-8)}{2})$
 So center = $(11, 2)$
 So $r^2 = \frac{(\sqrt{500})^2}{2^2} = \frac{500}{4} = 125$

8. Identify the center and foci of the ellipse, $\frac{(x+4)^2}{16} + \frac{(y-1)^2}{36} = 1$

- a. Center: (-4, 1); Foci: $(-4 \pm 2\sqrt{5}, 1)$ b. Center: ~~(4, -1)~~; Foci: $(4 \pm 2\sqrt{5}, -1)$
c. Center: (-4, 1); Foci: $(-4, 1 \pm 2\sqrt{5})$ d. Center: ~~(4, -1)~~; Foci: $(4, -1 \pm 2\sqrt{5})$

① $c^2 = a^2 - b^2$
 $c^2 = 36 - 16$
 $c^2 = 20$
 $c = \pm 2\sqrt{5}$

② C: (-4, 1) x: 4 y: 6



9. State the length of the major and minor axes of $\frac{(x+4)^2}{16} + \frac{(y-1)^2}{36} = 1$. (see #8)

- a. Major: 4 b. Major: 6 c. Major: 36 **d. Major: 12**
 Minor: 6 Minor: 4 Minor: 16 Minor: 8

10. What is the slope of the asymptotes for the hyperbola: $\frac{(y+4)^2}{16} - \frac{(x+2)^2}{8} = 1$. $m = \pm \frac{4}{2} = \pm 2$

- a. **$m = \pm 2$** b. $m = \pm \frac{1}{2}$ c. $m = \pm \frac{\sqrt{2}}{2}$ d. $m = \pm \sqrt{2}$

11. Identify the type of conic section from the equation: $4y^2 + 16y + 4x^2 - 24y = 12$.

- a. **Circle** b. Ellipse c. Parabola d. Hyperbola

12. What is the solution of the system of equations?

- a. (0, -3) b. (-1, -4) c. (-3, 0) and (1, 0) **d. (-2, -3) and (2, 5)**

$y = 2x + 1$ ① $2x + 1 = x^2 + 2x - 3$
 $0 = x^2 - 4$
 $0 = (x + 2)(x - 2)$
 $x = \pm 2$
 ② $x = 2 \mid x = -2$
 $y = 2x + 1 \mid y = 2x + 1$
 $y = 4 + 1 \mid y = -4 + 1$
 $y = 5 \mid y = -3$

PreCalculus Fall Exam Review

Name _____

Matrices

Multiple Choice - Choose the best answer for each question.

1. Find $7A + 6B$.

$$A = \begin{bmatrix} 1 & -1 \\ 0 & -3 \\ 5 & 2 \end{bmatrix} \quad B = \begin{bmatrix} -2 & 1 \\ 5 & 4 \\ 0 & -7 \end{bmatrix}$$

$$\begin{bmatrix} 7 & -7 \\ 0 & -21 \\ 35 & 14 \end{bmatrix} + \begin{bmatrix} -12 & 6 \\ 30 & 24 \\ 0 & -42 \end{bmatrix}$$

a. ~~$\begin{bmatrix} 19 & -13 \\ 30 & 3 \\ -35 & 56 \end{bmatrix}$~~

b. ~~$\begin{bmatrix} -5 & -1 \\ 0 & 3 \\ 0 & -28 \end{bmatrix}$~~

c. ~~$\begin{bmatrix} -5 & -1 \\ -30 & -45 \\ 35 & 56 \end{bmatrix}$~~

d. $\begin{bmatrix} -5 & -1 \\ 30 & 3 \\ 35 & -28 \end{bmatrix}$

2. Evaluate the determinant:

$$\begin{vmatrix} -5 & -5 & 4 \\ -5 & 4 & -1 \\ 0 & 3 & -1 \end{vmatrix} = (20 + 0 - 60) - (0 + 15 - 25) = -40 + 10 - 30 = -70$$

a. 30

b. -50

c. $\begin{bmatrix} -30 \end{bmatrix}$

d. -40

3. Solve using a matrix equation:

$$\begin{cases} -3x + 10y = 3 \\ x - 3y = -3 \end{cases}$$

a. $\begin{bmatrix} 21 \\ 6 \end{bmatrix}$

b. $\begin{bmatrix} -6 \\ -21 \end{bmatrix}$

c. $\begin{bmatrix} -21 \\ -6 \end{bmatrix}$

d. no solution

$$\begin{bmatrix} -3 & 10 \\ 1 & -3 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ -3 \end{bmatrix}$$

inv \rightarrow

$$\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{9-10} \begin{bmatrix} -3-10 \\ -1-3 \end{bmatrix} \begin{bmatrix} 3 \\ -3 \end{bmatrix} = \frac{1}{-1} \begin{bmatrix} -13 \\ -4 \end{bmatrix} \begin{bmatrix} 3 \\ -3 \end{bmatrix} = \begin{bmatrix} 39 \\ 12 \end{bmatrix}$$

4. Multiply:

$$\begin{bmatrix} -7 & 6 \\ 1 & 6 \end{bmatrix} \begin{bmatrix} -4 & 1 \\ -4 & 3 \end{bmatrix}$$

$$\begin{bmatrix} 28-24 & -7+18 \\ -4-24 & 1+18 \end{bmatrix} = \begin{bmatrix} 4 & 11 \\ -28 & 19 \end{bmatrix}$$

a. $\begin{bmatrix} 28 & -24 \\ -7 & 18 \end{bmatrix}$

b. $\begin{bmatrix} 4 & 11 \\ 19 & -28 \end{bmatrix}$

c. $\begin{bmatrix} -4 & -24 \\ 1 & 18 \end{bmatrix}$

d. $\begin{bmatrix} 4 & 11 \\ -28 & 19 \end{bmatrix}$

5. State the dimensions of the matrix. Identify the indicated element.

$$A = \begin{bmatrix} -9 & 1 \\ -7 & 5 \\ -5 & 8 \end{bmatrix}, a_{2,1}$$

a. $3 \times 2; 5$

b. $2 \times 3; 1$

c. $2 \times 3; 7$

d. $3 \times 2; -7$

6. Solve for t and y:

$$\begin{bmatrix} -6-t & 0 \\ 8 & -5 \end{bmatrix} = \begin{bmatrix} -5 & 0 \\ 8 & 3y-2 \end{bmatrix}$$

a. $t=1, y=-1$
b. $t=-11, y=1$

c. $t=-1, y=2$
d. $t=-1, y=1$

$$\begin{aligned} -6-t &= -5 & -5 &= 3y-2 \\ -t &= 1 & -3 &= 3y \\ t &= -1 & 1 &= y \end{aligned}$$

7. $\begin{vmatrix} -10 & 10 \\ 5 & -7 \end{vmatrix}$

a. -120

b. 20

c. 120

d. -20

$$70 - 50 = 20$$

8. $\begin{bmatrix} 7 & 2 & 0 \\ -5 & 9 & 9 \end{bmatrix} + \begin{bmatrix} +1 & -3 & -8 \\ -3 & -4 & -7 \end{bmatrix}$

a. ~~$\begin{bmatrix} 8 & -8 \\ -8 & 5 & 2 \end{bmatrix}$~~

b. $\begin{bmatrix} 8 & -1 & -8 \\ -8 & 5 & 2 \end{bmatrix}$

c. ~~$\begin{bmatrix} 8 & -1 & -8 \\ -5 & 2 \end{bmatrix}$~~

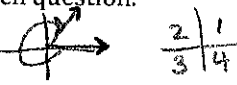
d. ~~$\begin{bmatrix} 8 & -1 & -8 \\ -8 & 5 & 2 \end{bmatrix}$~~

Angles in Trig

Multiple Choice - Choose the best answer for each question.

1. In which quadrant does a -285° angle lie?

- a. I b. II c. III d. IV



2. Which angle is not coterminal with an angle that measures 300° ?

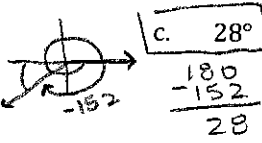
- a. -420° ✓ b. -300° c. -60° ✓ d. 660° ✓

$300 - 360 = -60$ $-360 = -420$

$300 + 360 = 660$

3. What is the reference angle for -512° ?

- a. -208° b. -28° c. 28° d. 280°



4. An angle of $\frac{3\pi}{4}$ radians lies in quadrant

- a. I b. II c. III d. IV



5. The value of $\tan 315^\circ$ is the same as the value of (Unit circle)

- a. $\cos 0^\circ = 1$ b. $\sin 90^\circ = 1$ c. $\tan 135^\circ = -1$ d. $\sin 180^\circ = 0$

$\tan 315^\circ = -1$

6. Express 330° in radian measure. (Unit circle)

- a. $\frac{5\pi}{6}$ b. $\frac{5\pi}{3}$ c. $\frac{11\pi}{6}$ d. $\frac{11\pi}{4}$

$330^\circ \cdot \frac{\pi}{180} = \frac{11\pi}{6}$

7. Use a calculator to approximate $\sec 59^\circ = \frac{1}{\cos 59^\circ}$

- a. -1.2969 b. 1 c. 1.9416 d. 1.1667

8. Use a calculator to approximate $\cos 14$. *calc should be in "rad"

- a. 0.9703 b. 0.1367 c. 0.9702 d. impossible

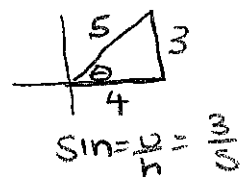
9. Change 150° to radian measure in terms of π . (Unit circle)

- a. $\frac{6\pi}{5}$ b. $\frac{3\pi}{5}$ c. $\frac{5\pi}{6}$ d. $\frac{5\pi}{3}$

$150^\circ \cdot \frac{\pi}{180} = \frac{5\pi}{6}$

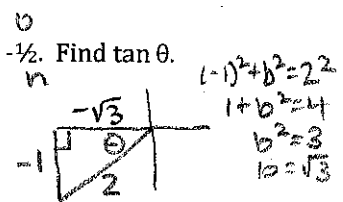
10. The terminal side of an angle θ in standard position passes through the point (4, 3). Find $\sin \theta$.

- a. $\frac{3}{5}$ b. $\frac{5}{3}$ c. $\frac{4}{5}$ d. $\frac{5}{4}$



11. θ is the measure of an angle in standard position with its terminal side in Quadrant III and $\sin \theta = -\frac{1}{2}$. Find $\tan \theta$.

- a. $\sqrt{3}$ b. $\frac{1}{\sqrt{3}}$ c. $\frac{2}{3}$ d. $-\frac{1}{\sqrt{3}}$



$(-1)^2 + b^2 = 2^2$
 $1 + b^2 = 4$
 $b^2 = 3$
 $b = \sqrt{3}$

12. If $\sin \theta = -\frac{1}{5}$, what is $\csc \theta$?

- a. $\frac{1}{5}$ b. 5 c. 0 d. -5

reciprocal

$\tan = \frac{b}{a} = \frac{-1}{-\sqrt{3}}$
 $= \frac{1 \cdot \sqrt{3}}{\sqrt{3} \cdot \sqrt{3}}$
 $= \frac{\sqrt{3}}{3}$

Triangle Trig

Multiple Choice - Choose the best answer for each question.

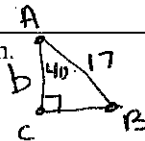
1. In right ΔABC , $A = 40^\circ$, $C = 90^\circ$, and $c = 17$. Find b .

a. 12

b. 13

c. 14

d. 15



$$\cos 40^\circ = \frac{b}{17}$$

$$b = 17 \cos 40^\circ$$

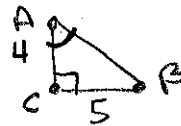
2. In right ΔABC , $a = 5$, $b = 4$, and $C = 90^\circ$. Find A .

a. 89.606°

b. 38.660°

c. 60°

d. 51.340°



$$\tan A = \frac{5}{4}$$

$$A = \tan^{-1}\left(\frac{5}{4}\right)$$

$$A = 51.340^\circ$$

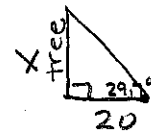
3. From a point 20 feet in front of a tree, the angle of elevation to the top of the tree is 29.7° . Find the height of the tree to the nearest foot.

a. 136.1 ft

b. 11 ft

c. 14.7 ft

d. 594 ft



$$\tan 29.7^\circ = \frac{x}{20}$$

$$x = 20 \tan 29.7^\circ$$

$$x = 11.40779859$$

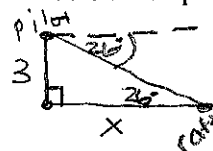
4. An airplane pilot sights a life raft at a 26° angle of depression. The airplane's altitude is 3 km. What is the airplane's horizontal distance d from the raft? Round your answer to the nearest whole number.

a. 5 km

b. 6 km

c. 4 km

d. 3 km



$$\tan 26^\circ = \frac{3}{x}$$

$$x \tan 26^\circ = 3$$

$$x = \frac{3}{\tan 26^\circ}$$

$$x = 6.1569115$$

5. What is the exact value of the cosine of 45° ? (Unit circle)

a. $\frac{\sqrt{3}}{2}$

b. 1

c. $-\frac{\sqrt{2}}{2}$

d. $\frac{\sqrt{2}}{2}$

6. What is the exact value of the sine of 120° ? (Unit circle)

a. $\frac{\sqrt{3}}{2}$

b. $-\frac{\sqrt{3}}{2}$

c. $\frac{1}{2}$

d. $\frac{\sqrt{2}}{2}$

7. What is the exact value of the tangent of 150° ? (Unit circle)

a. $-\sqrt{3}$

b. $\sqrt{3}$

c. $-\frac{\sqrt{3}}{3}$

d. $\frac{\sqrt{3}}{3}$

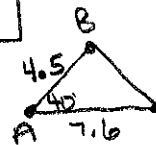
8. In ΔABC , $A = 40^\circ$, $b = 7.6$, and $c = 4.5$. Find a to the nearest tenth.

a. 4.0

b. 3.0

c. 5.1

d. 4.5



$$\text{SAS} \rightarrow \text{Law of Cosines}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$a = \sqrt{7.6^2 + 4.5^2 - 2(7.6)(4.5)\cos 40^\circ}$$

$$a = 5.060885307$$

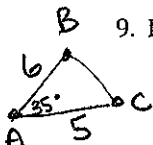
9. In ΔABC , $A = 35^\circ$, $b = 5$ cm, and $c = 6$ cm. Find the area of the triangle to the nearest tenth of a cm^2 .

a. 8.4 cm^2

b. 8.6 cm^2

c. 8.5 cm^2

d. 8.3 cm^2



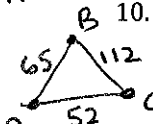
10. In ΔABC , $a = 112$ cm, $b = 52$ cm, and $c = 65$ cm. Find the measure of angle A .

a. 56°

b. 124°

c. 146°

d. does not exist



11. A triangle has side lengths of 20 in, 24 in, and 30 in. Find the area of the triangle.

a. 478.2 in^2

b. 239.2 in^2

c. 298.9 in^2

d. 358.6 in^2

$$S = \frac{20+24+30}{2} = 37$$

$$A = \frac{1}{2} \sqrt{37(37-20)(37-24)(37-30)} = 239.2467346$$

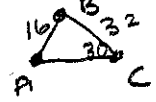
12. In ΔABC , $C = 30^\circ$, $a = 32$, and $c = 16$. Determine how many triangles can be formed.

a. one

b. two

c. three

d. none



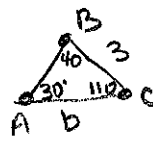
13. In ΔABC , $A = 30^\circ$, $B = 40^\circ$, and $a = 3$. Find the length of side b .

a. $b = 3.86$

b. $b = 4.86$

c. $b = 5.64$

d. $b = 5.64$



$$\frac{b}{\sin 40^\circ} = \frac{3}{\sin 30^\circ}$$

$$b \sin 30^\circ = 3 \sin 40^\circ$$

$$b = \frac{3 \sin 40^\circ}{\sin 30^\circ} = 3.856725650$$

$$A = \frac{1}{2} bc \sin A$$

$$A = \frac{1}{2} (5)(6) \sin 35^\circ$$

$$A = 8.603646545$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$112^2 = 52^2 + 65^2 - 2(52)(65) \cos A$$

$$-52^2 - 65^2 = -165^2$$

$$\frac{5615}{-6760} = \frac{-6760 \cos A}{-6760}$$

$$A = \cos^{-1}\left(\frac{5615}{-6760}\right)$$

$$A = 146.1626137$$

$$\frac{16}{\sin 30^\circ} = \frac{32}{\sin A}$$

$$\sin A = \frac{32 \sin 30^\circ}{16}$$

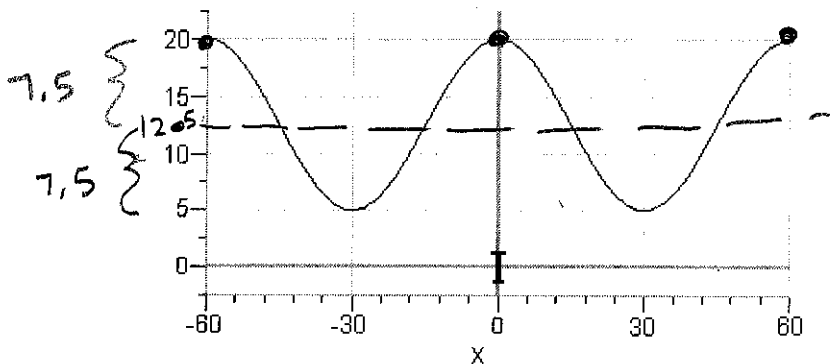
$$A = \sin^{-1}\left(\frac{32 \sin 30^\circ}{16}\right)$$

$$A = 90^\circ \text{ R+}\Delta \text{ only!}$$

Sine and Cosine Graphs

Multiple Choice - Choose the best answer for each question.

Use the graph shown below to answer question 1 - 3.



1. What is the AMPLITUDE of the graph shown?

- a. 15 **b. 7.5** c. 30 d. 60

2. What is the PERIOD of the graph shown?

- a. 15 b. 7.5 c. 30 **d. 60**

3. What is the VERTICAL SHIFT of the graph shown?

- a. 12.5** b. 5 c. 20 d. 30

4. The amplitude of the graph of $y = -2\cos 3x$ is what value? $|-2| = 2$

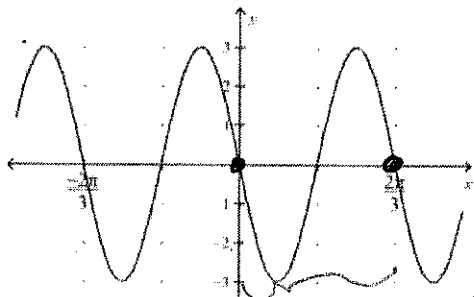
- a. 2** b. -2 c. 3 d. -3

5. What is the phase shift of the graph of $y = 4\sin(2x + \pi)$?

- a. left π b. right π c. right $\frac{\pi}{2}$ **d. left $\frac{\pi}{2}$**

$2x + \pi = 0$
 $2x = -\pi$
 $x = -\frac{\pi}{2}$ (Left)

6. Write the equation of the function shown in the graph.



- a. $f(t) = 3\sin 6t$
 b. $f(t) = 6\cos 3t$
c. $f(t) = -3\sin 3t$
 d. $f(t) = 3\sin 3t$

$y = a\sin b(x-c) + d$
 $y = -3\sin 3(x-0) + 0$
 $y = -3\sin x$

$Pd = \frac{2\pi}{3} \times \frac{2\pi}{b} \rightarrow \frac{8\pi}{3} = \frac{6\pi}{2\pi} \rightarrow b = 3$

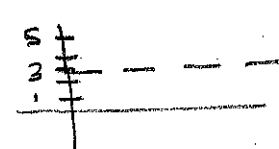
7. What is the period of the graph whose equation is $y = 3\cos 2\theta$?

- a. 180°** b. 2 c. 3 d. 360°

$Pd = \frac{360}{b}$
 $2 = \frac{360}{b}$
 $b = 180$

8. What is the minimum value in the range of $y = 2\sin x + 3$? $[1, 5]$

- a. 1** b. 0 c. -1 d. -5



9. What is the period of the graph to the right?

- a. 2π b. π **c. 4π** d. 2

10. What is the equation for the accompanying graph?

- a. $y = \cos 2x$ b. $y = 2\cos x$ c. $y = \frac{1}{2}\cos x$ **d. $y = \cos \frac{1}{2}x$**

$y = a\cos b(x-c) + d$
 $y = 10\cos \frac{1}{2}(x-0) + 0$
 $y = 10\cos \frac{1}{2}x$

$Pd = \frac{2\pi}{b}$
 $\frac{4\pi}{1} = \frac{2\pi}{b}$
 $\frac{4\pi}{4\pi} = \frac{2\pi}{4\pi} \rightarrow b = \frac{1}{2}$

