# MA 15400

## Practice Final Exam

Purdue  Department of Mathematics

1.    If θ is in the second quadrant, and $\sin\theta = 0.6$, find $\cos\theta$.

    A.  $-0.75$
    B.  $0.2$
    C.  $-0.8$
    D.  $0.8$
    E.  None of the above.

2.    The following angles are all coterminal except:

    A.  $\dfrac{\pi}{3}$
    B.  $-\dfrac{5\pi}{3}$
    C.  $-300°$
    D.  $420°$
    E.  $-60°$

3.    The radian measure of an angle of $135°$ is:

    A.  $\dfrac{5\pi}{4}$
    B.  $\dfrac{3\pi}{2}$
    C.  $\dfrac{3\pi}{4}$
    D.  $\dfrac{7\pi}{8}$
    E.  None of the above.

4.    Use a calculator to find $\sec 126°$ correct to 4 decimal places.

    A.  $1.2361$
    B.  $-0.5878$
    C.  $-1.7013$
    D.  $-1.2361$
    E.  None of the above.

5.    If the point $(12,-16)$ is on the terminal side of angle $\theta$, find $\tan\theta$.

A.  $\dfrac{5}{3}$

B.  $-\dfrac{5}{4}$

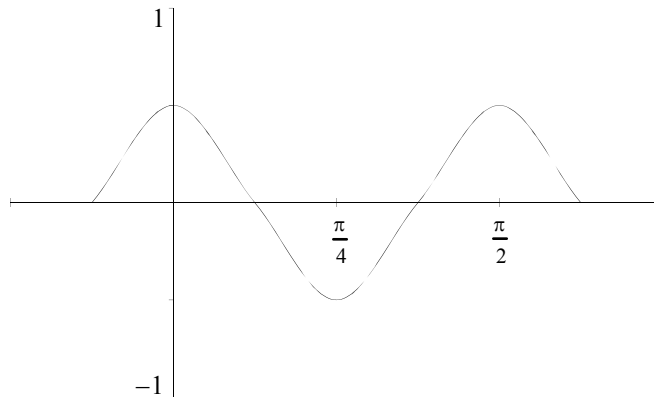C.  $\dfrac{4}{3}$

D.  $\dfrac{4}{5}$

E.  None of the above.


6.    If the diameter of a circle is 6 cm, find the length of the arc that subtends a central angle of $30°$.

A.  1.571 cm
B.  2.356 cm
C.  3.142 cm
D.  9.425 cm
E.  None of the above.


7.    Find the area of a sector determined by $\theta$ in problem #6.

A.  1.571 cm$^2$
B.  2.356 cm$^2$
C.  3.142 cm$^2$
D.  9.425 cm$^2$
E.  None of the above.


8.    Sketched below is a portion of the graph of which trigonometric function?



A.  $y = \dfrac{1}{2}\cos\left(\dfrac{1}{4}x\right)$

B.  $y = 4\cos(2x)$

C.  $y = \dfrac{1}{2}\cos(4x)$

D.  $y = 4\cos\left(\dfrac{1}{2}x\right)$

E.  $y = \dfrac{1}{4}\cos(2x)$

9.  The graph of y = 3 + sin x          (Choose all the correct answers.)

       I.     crosses the *y*-axis at 3
      II.    crosses the *x*-axis at multiples of $\pi$
      III.   is always above the *x*-axis
      IV.   has period $2\pi$

      A.  I, II
      B.  I, III, IV
      C.  I, II, IV
      D.  II, IV
      E.  None of the above.

10.     Give the domain, *D*, and the range, *R*, of $f(x) = \cos x$.

      A.  *D* = set of all real numbers, R=[−1, 1]
      B.  *D* = [0, ∞), *R* = set of all real numbers.
      C.  *D* = [0, 2π], *R* = [−1, 1]
      D.  D = set of all real numbers, *R* = [0, 2π]
      E.  None of the above.

11.     From a point *P* on level ground the angle of elevation of the top of the tower is 26°50'. From a point 25.0 meters closer to the tower and on the same line with *P* and the base of the tower, the angle of elevation of the top of the tower is 43°30'. Find the height of the tower correct to one decimal place.

      A.  39.3 meters
      B.  12.6 meters
      C.  27.1 meters
      D.  23.7 meters
      E.  None of the above.

12.     The expression $\dfrac{\tan^2 x}{1 + \sec x}$ is equal to:

      A.  1
      B.  $\sec x - 1$
      C.  $\tan x + \sin x$
      D.  $\tan^2 x + \sin x \tan x$
      E.  $\csc x + \sin x$

13.     Simplify $\dfrac{\tan x \cos x \csc x}{\cot x \sec x \sin x}$ .

     A.  $\tan^2 x \cos^2 x$
     B.  1
     C.  $\csc^2 x$
     D.  0
     E.  $\tan^2 x$

14.     Reduce to a single term: $\cos(2\alpha)\cos(\beta)+\sin(2\alpha)\sin(\beta)$

     A.  $\sin(2\alpha+\beta)$
     B.  $\sin(2\alpha-\beta)$
     C.  $\cos(2\alpha-\beta)$
     D.  $\cos(2\alpha+\beta)$
     E.  None of the above.

15.     Find all the solutions of $3\cos^2 x + 2\sin x + 2 = 0$ in the interval $[0, 2\pi)$

     A.  $x = 0, \dfrac{\pi}{2}$
     B.  $x = \dfrac{\pi}{4}, \dfrac{\pi}{2}$
     C.  $x = \dfrac{\pi}{2}$
     D.  $x = \dfrac{\pi}{4}$
     E.  None of the above.

16.     How many solutions of the equation $\sin 2\theta = \cos\theta$ lie in the interval $[0, 2\pi)$?

     A.  2
     B.  3
     C.  4
     D.  1
     E.  None of the above.
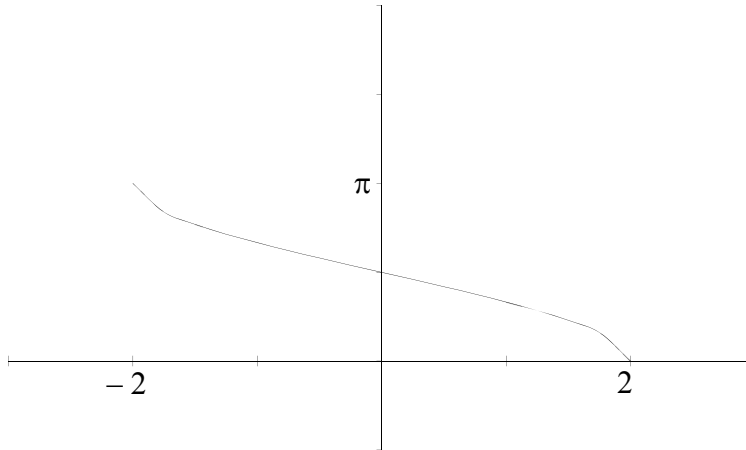
17.    Find $\cos\theta$ in the given triangle.
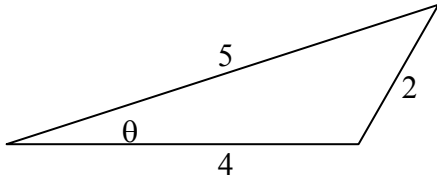
A. $\dfrac{37}{20}$        B. $\dfrac{7}{40}$

C. $\dfrac{5}{16}$        D. $\dfrac{37}{40}$

E.  None of the above

18.    Given $\cos\theta = \dfrac{3}{4}$ and $270° < \theta < 360°$, find $\sin 2\theta$

A. $\dfrac{-3\sqrt{7}}{8}$        B. $\dfrac{-\sqrt{7}}{4}$

C. $\dfrac{1}{8}$        D. $\dfrac{3\sqrt{7}}{8}$

E.  None of the above.

19.    Which equation best describes the graph given below?

A. $y = 2\cos^{-1}(2x)$

B. $y = \cos^{-1}\left(\dfrac{x}{2}\right)$

C. $y = \dfrac{1}{2}\cos^{-1}\left(\dfrac{x}{2}\right)$

D. $y = \cos^{-1}(2x)$

E.  None of the above.

20.     Find the $\cos\left(2\arcsin\left(\dfrac{4}{5}\right)\right)$. Do not use a calculator.

     A. $\dfrac{7}{25}$          B. $-\dfrac{7}{25}$

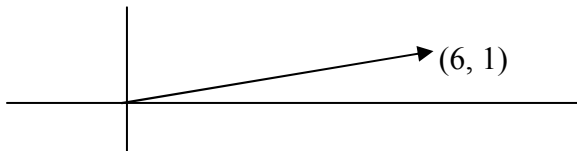     C. $\dfrac{32}{25}$          D. $-\dfrac{32}{25}$

     E. None of the above.

21.     Point A is 2.0 miles north of B. The bearing from A to C is $S35°W$ and the bearing from B to C is $S86°W$. Find the distance from A to C correct to one decimal place.

     A. 2.6 miles
     B. 1.6 miles
     C. 1.5 miles
     D. 3.5 miles
     E. None of the above.

22.     Find the magnitude of the vector $\langle 2,3 \rangle$

     A. 6
     B. $\sqrt{6}$
     C. 13
     D. $\sqrt{13}$
     E. None of the above.

23.     If $a = \langle 2,2 \rangle$ and $b = \langle -2,3 \rangle$, the sketch below corresponds to:

     (6, 1)

     A. $a+b$
     B. $a-b$
     C. $2a+b$
     D. $2a-b$
     E. None of the above.

24. If 6.0 lb, 110° is the magnitude and direction of one force and 2.0 lb, 240° is the magnitude and direction of a second force, calculate the magnitude (to one decimal place) and the direction (to the nearest degree) of the resultant.

    A. 5.0 lb, 128°
    B. 7.4 lb, 121°
    C. 5.0 lb, 121°
    D. 7.4 lb, 128°
    E. None of the above.

25. Which equation best describes that graph given below?
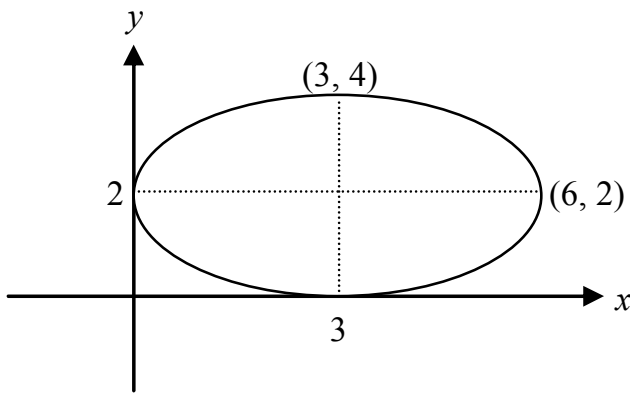


A. $\dfrac{(x-6)^2}{3}+\dfrac{(y-4)^2}{2}=1$

B. $\dfrac{(x-6)^2}{9}+\dfrac{(y-4)^2}{9}=1$

C. $\dfrac{(x-3)^2}{9}+\dfrac{(y-2)^2}{4}=1$

D. $\dfrac{(x-3)^2}{4}+\dfrac{(y-2)^2}{9}=1$

E. $\dfrac{(x-2)^2}{9}+\dfrac{(y-3)^2}{4}=1$

26. Classify the equations given below.

    I.　$x^2 - y^2 + 2x = 15$

    II.　$x^2 + 3y^2 + 4x - 2y - 5 = 0$

    III.　$x^2 - 4x + y - 7 = 0$

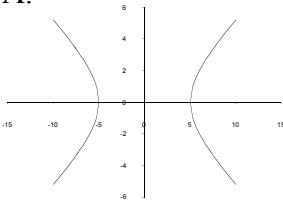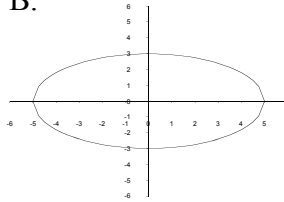|   | | | | | |
|---|---|---|---|---|---|
| A. | I. *ellipse*<br>II. *parabola*<br>III. *hyperbola* | B. | I. *hyperbola*<br>II. *ellipse*<br>III. *parabola* | C. | I. *parabola*<br>II. *hyperbola*<br>III. *ellipse* |
| D. | I. *hyperbola*<br>II. *parabola*<br>III. *ellipse* | E. | I. *parabola*<br>II. *ellipse*<br>III. *hyperbola* | F. | I. *ellipse*<br>II. *hyperbola*<br>III. *parabola* |

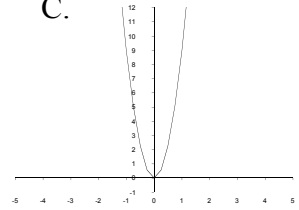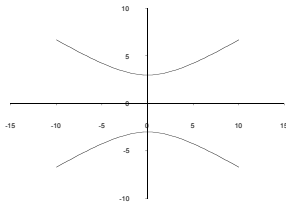27.      The graph of $9x^2 - 25y^2 = 225$ most closely resembles which graph sketched below?

A.

B.
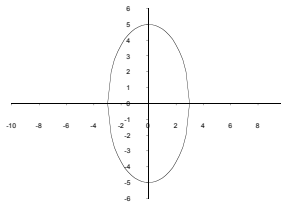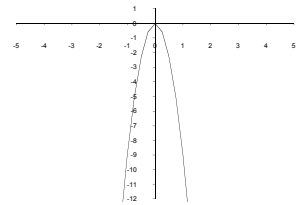
C.

D.

E.

F.

28.      Find the vertex of the parabola $y^2 - 4y - 2x - 4 = 0$

     A. $(2, -8)$
     B. $(-4, 2)$
     C. $(2, -4)$
     D. $(-8, 2)$
     E. None of the above.

29.      An arch of a bridge over a roadway is semi elliptical with major axis horizontal. The base of the arch is 30 feet across and highest part of the arch is 10 feet above the horizontal roadway. Find the height of the arch 10 feet from the center of the base.

     A. 9.4 feet
     B. 8.9 feet
     C. 7.5 feet
     D. 10.0 feet
     E. None of the above.

30.　What are the vertical asymptotes of the graph of $f(x) = \dfrac{x^2 - 9}{x^2 + 2x}$ ?

A. $x = 0$
B. $x = 2$
C. $x = 0, x = -2$
D. $x = 3, x = -3$
E. None of the above.

31.　The graph of $f(x) = \dfrac{x - 2}{x + 2}$ most closely resembles which graph sketched below?

A.　　　　　B.　　　　　C.　　　　D.　　　　　E.
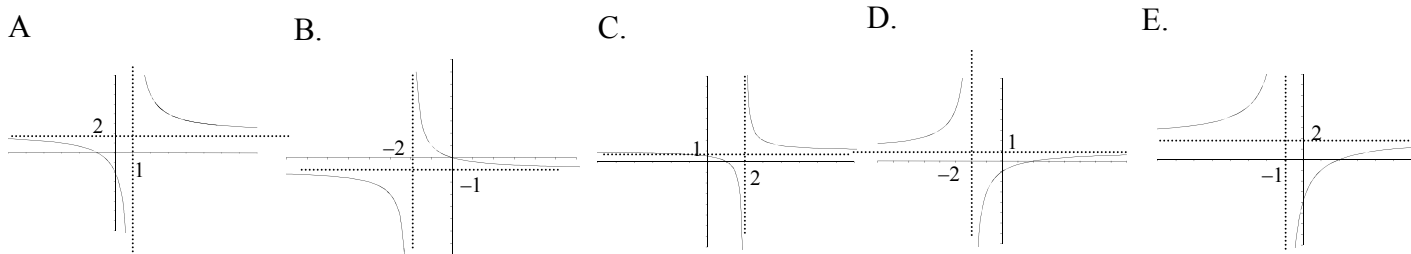


32.　Find the reference angle for $\theta = -156°$

A. $\theta_R = 156°$
B. $\theta_R = 204°$
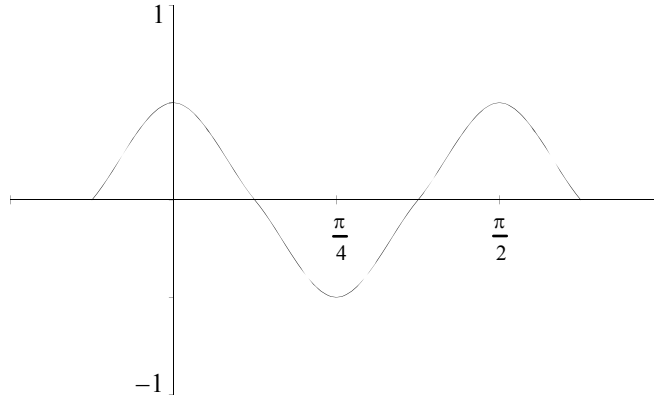C. $\theta_R = 66°$
D. $\theta_R = 24°$
E. None of the above.

33.　Find the reference angle for $\theta = \dfrac{4\pi}{3}$

A. $\theta_R = \dfrac{\pi}{3}$
B. $\theta_R = \dfrac{4\pi}{3}$
C. $\theta_R = \dfrac{2\pi}{3}$
D. $\theta_R = -\dfrac{2\pi}{3}$
E. None of the above.

34.　Find all the values of $\theta$ in the interval $[0, 2\pi)$ that satisfies the equation $\sin \theta = -0.5873$. Round your answer to two decimals.

A. $-0.63, 3.77$
B. $0.63, 2.51$
C. $3.77, 5.66$
D. $5.34, 2.20$
E. None of the above.

35.      Sketched below is a portion of the graph of which trigonometric function?



A.   $y = \dfrac{1}{2}\sin\left(4x + \dfrac{\pi}{2}\right)$

B.   $y = 4\sin\left(\dfrac{1}{2}x - \dfrac{\pi}{2}\right)$

C.   $y = \dfrac{1}{2}\sin\left(\dfrac{1}{4}x + \dfrac{\pi}{2}\right)$

D.   $y = 4\sin\left(\dfrac{1}{2}x + \dfrac{\pi}{2}\right)$

E.   $y = \dfrac{1}{2}\sin\left(4x - \dfrac{\pi}{2}\right)$

36.      Find the **unit** vector in the **same** direction as vector *a*.

         $a = 5i - 8j$.

A.   $-\dfrac{5}{\sqrt{89}}i + \dfrac{8}{\sqrt{89}}j$

B.   $\dfrac{5}{\sqrt{39}}i - \dfrac{8}{\sqrt{39}}j$

C.   $\dfrac{5}{\sqrt{89}}i - \dfrac{8}{\sqrt{89}}j$

D.   $-\dfrac{5}{\sqrt{39}}i + \dfrac{8}{\sqrt{39}}j$

E.   None of the above.

37.      Find the vector of magnitude 5 that is in the **opposite** direction of $\langle -4, 7 \rangle$.

A.   $\left\langle \dfrac{20}{\sqrt{65}}, -\dfrac{35}{\sqrt{65}} \right\rangle$

B.   $\left\langle -\dfrac{20}{\sqrt{33}}, \dfrac{35}{\sqrt{33}} \right\rangle$

C.   $\left\langle -\dfrac{20}{\sqrt{65}}, \dfrac{35}{\sqrt{65}} \right\rangle$

D.   $\left\langle \dfrac{20}{\sqrt{33}}, -\dfrac{35}{\sqrt{33}} \right\rangle$

E.   None of the above.

# Answers:

| | | | | |
|---|---|---|---|---|
| 1 | C | | 20 | B |
| 2 | E | | 21 | A |
| 3 | C | | 22 | D |
| 4 | C | | 23 | D |
| 5 | E (-4/3) | | 24 | A |
| 6 | A | | 25 | C |
| 7 | B | | 26 | B |
| 8 | C | | 27 | A |
| 9 | B | | 28 | B |
| 10 | A | | 29 | C |
| 11 | C | | 30 | C |
| 12 | B | | 31 | D |
| 13 | B | | 32 | D |
| 14 | C | | 33 | A |
| 15 | E ($3\pi/2$) | | 34 | C |
| 16 | C | | 35 | A |
| 17 | D | | 36 | C |
| 18 | A | | 37 | A |
| 19 | B | | | |