MA 15400

Practice Final Exam

Purdue Mathematics Department

Revised December, 2012

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

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

2. The angles with measures listed are all coterminal except:

A. $\frac{\pi}{3}$
B. $-\frac{5\pi}{3}$
C. $-1020°$
D. $420°$
E. $-60°$

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

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

4. Find the sec $126°$ to 4 decimal places.

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

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

A. $\frac{5}{3}$
B. $\frac{-5}{4}$
C. $\frac{4}{3}$
D. $\frac{4}{5}$
E. None of the above.

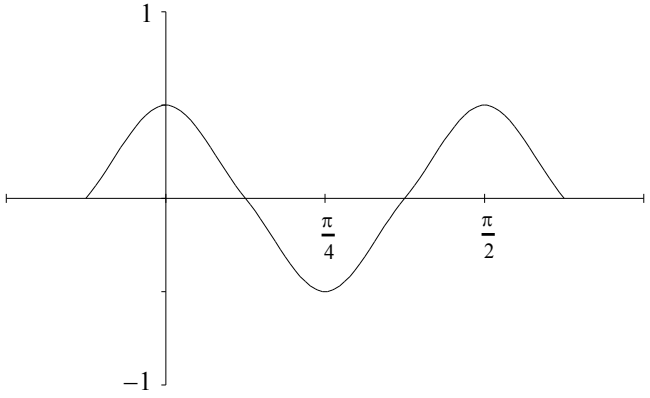
6. Find the length of the arc that subtends a central angle of $30°$ on a circle of diameter 6 cm,

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 θ 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, in the form $y = a\cos(bx)$ with $a > 0$ and $b > 0$?



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

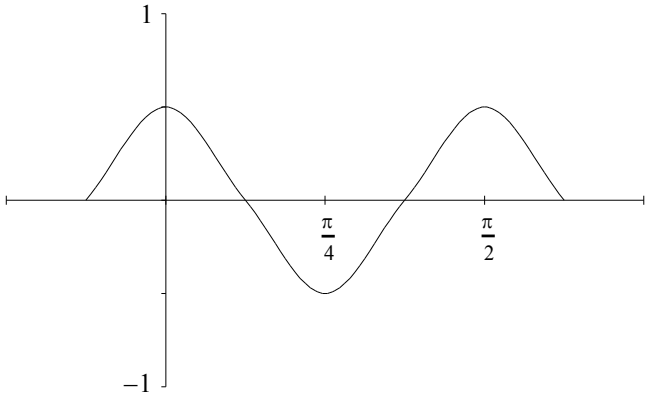
B. $y = 4\cos(2x)$

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

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

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

9. Sketched below is a portion of the graph of which trigonometric function, in the form $y = a\sin(bx + c)$ with $a > 0, b > 0,$ and least postive value of c?



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

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

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

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

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

10. The graph of $y = 3 + \sin x$… (Choose all the correct answers.)

I. …crosses the *y*-axis at 3

II. …is decreasing in the interval $\left(\frac{3\pi}{2}, 2\pi\right)$

III. …contains the point $\left(\frac{\pi}{2}, 2\right)$

IV. …has period 2π

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

A. D = set of all real numbers, R=[–1, 1]
B. $D = [0, \infty)$, R = set of all real numbers.
C. $D = [0, 2\pi]$, $R = [-1, 1]$
D. D = set of all real numbers, $R = [0, 2\pi]$
E. None of the above.

12. From a point P on level ground the angle of elevation of the top of the tower is $27°$. From a point 25 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 $43°$. Find the height of the tower correct to one decimal place.

A. 39.3 meters
B. 41.2 meters
C. 28.1 meters
D. 61.9 meters
E. None of the above.

13. 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. $\csc x + \sin x$

14. 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. $\tan^2 x$

15. Reduce to a single term: $\cos(2A)\cos B + \sin(2A)\sin B$.

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

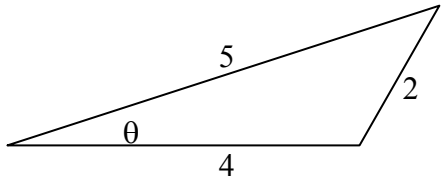
16. Find all the solutions of $3\cos^2 x + 2\sin x + 2 = 0$ in the interval $[0, 2\pi)$

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

17. Find the solutions of the equation $\sin 2\theta = \cos\theta$ in the interval $[0, 2\pi)$?

A. $\theta = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{3}, \frac{2\pi}{3}$
B. $\theta = 0, \pi, \frac{\pi}{6}, \frac{5\pi}{6}$
C. $\theta = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{\pi}{6}, \frac{5\pi}{6}$
D. $\theta = 0, \pi, \frac{\pi}{3}, \frac{2\pi}{3}$
E. None of the above.

18. Find $\cos\theta$ in the given triangle.



A. $\frac{37}{20}$

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

C. $\frac{5}{16}$

D. $\frac{37}{40}$

E. None of the above

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

A. $\frac{-3\sqrt{7}}{8}$

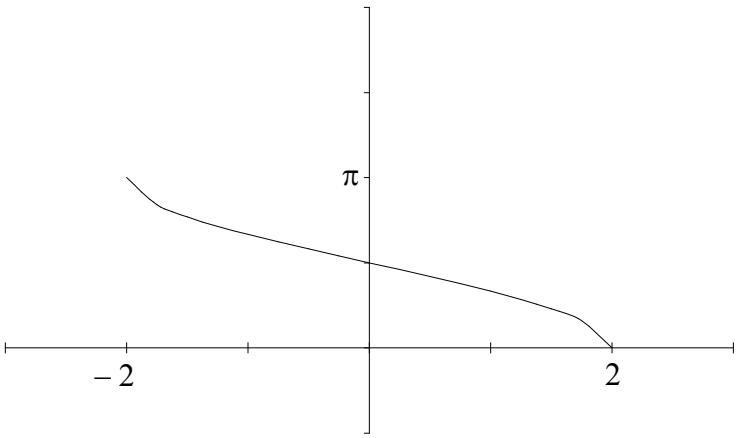
B. $\frac{-\sqrt{7}}{4}$

C. $\frac{1}{8}$

D. $\frac{3\sqrt{7}}{8}$

E. None of the above.

20. Which equation best describes the graph given below?



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

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

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

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

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

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

A. $\frac{7}{25}$

B. $-\frac{7}{25}$

C. $\frac{32}{25}$

D. $-\frac{32}{25}$

E. None of the above.

22. Point A is 2.0 miles **directly** 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.

23. Find the magnitude of the vector $a = \langle 2,3 \rangle$ and the smallest positive angle, rounded to the nearest tenth of a degree, from the *x*-axis to the vector.

A. $\|a\| = \sqrt{5},\ \theta = 56.3°$

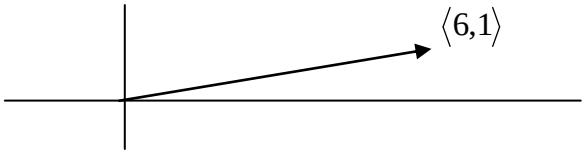
B. $\|a\| = \sqrt{13},\ \theta = 33.7°$

C. $\|a\| = \sqrt{5},\ \theta = 33.7°$

D. $\|a\| = \sqrt{13},\ \theta = 56.3°$

E. None of the above.

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



A. $\vec{a} + \vec{b}$

B. $\vec{a} - \vec{b}$

C. $2\vec{a} + \vec{b}$

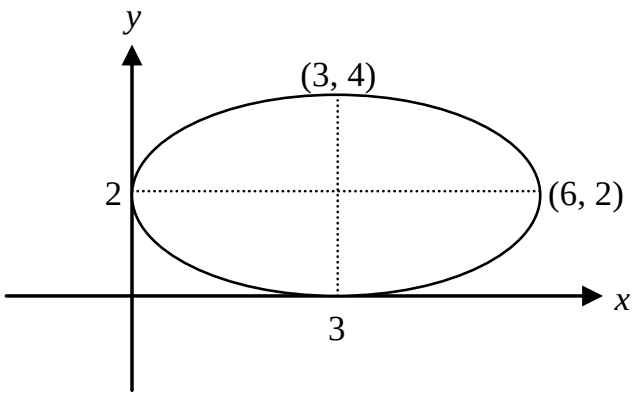
D. $2\vec{a} - \vec{b}$

E. None of the above.

25. 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.

26. Which equation best describes that graph given below?



A. $\frac{(x-6)^2}{3}+\frac{(y-4)^2}{2}=1$
B. $\frac{(x-6)^2}{9}+\frac{(y-4)^2}{9}=1$
C. $\frac{(x-3)^2}{9}+\frac{(y-2)^2}{4}=1$
D. $\frac{(x-3)^2}{4}+\frac{(y-2)^2}{9}=1$
E. $\frac{(x-2)^2}{9}+\frac{(y-3)^2}{4}=1$

27. Classify the equations given below.

I. $x^2-y^2+2x=15$

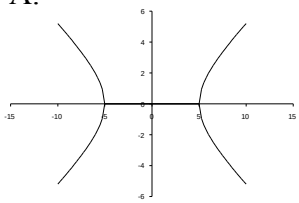
II. $x^2+3y^2+4x-2y-5=0$

III. $x^2-4x+y-7=0$

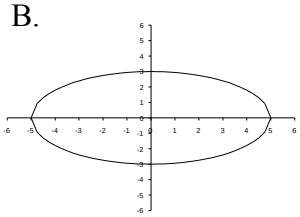
A. *I. ellipse*, *II. parabola*, *III. hyperbola*
B. *I. hyperbola*, *II. ellipse*, *III. parabola*
C. *I. parabola*, *II. hyperbola*, *III. ellipse*
D. *I. hyperbola*, *II. parabola*, *III. ellipse*
E. *I. parabola*, *II. ellipse*, *III. hyperbola*
F. *I. ellipse*, *II. hyperbola*, *III. parabola*

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

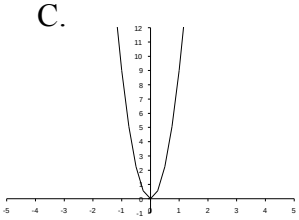
A.



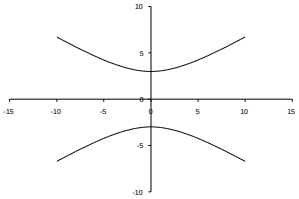
B.



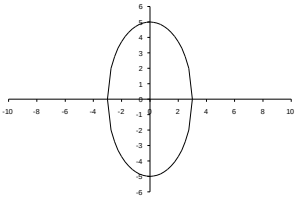
C.



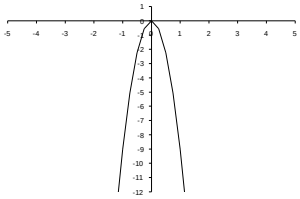
D.



E.



F.



29. 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.

30. 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.

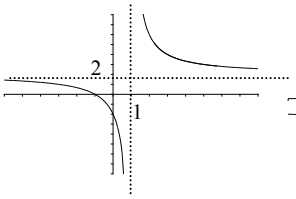
A. 9.4 feet
B. 8.9 feet
C. 7.5 feet
D. 10.0 feet
E. None of the above.

31. What are the vertical asymptote(s) of the graph of $f(x) = \dfrac{x^2 - 9}{x^2 - x - 6}$?

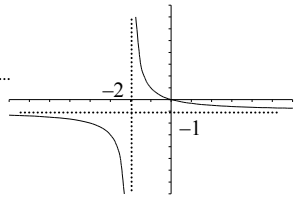
A. $x = 1$
B. $x = 3$
C. $x = -2$
D. $x = -2, x = 3$
E. None of the above.

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

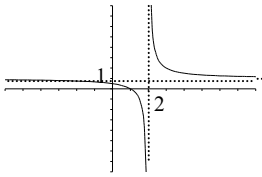
A



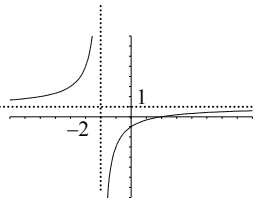
B.



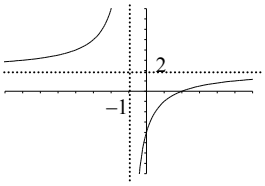
C.



D.



E.



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

A. $\theta_R = 156°$
B. $\theta_R = 204°$
C. $\theta_R = 56°$
D. $\theta_R = 24°$
E. None of the above.

34. Find the reference angle for $\theta = \frac{4\pi}{3}$

A. $\theta_R = \frac{\pi}{3}$

B. $\theta_R = \frac{4\pi}{3}$

C. $\theta_R = \frac{2\pi}{3}$

D. $\theta_R = \frac{-2\pi}{3}$

E. None of the above.

35. Find all the values of θ 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.

36. Find the unit vector in the same direction as $a = 5i - 8j$.

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

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

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

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

E. None of the above.

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

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

B. $\langle -20, 35 \rangle$

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

D. $\langle 20, -35 \rangle$

E. None of the above.

38. Find a vector that is in the same direction as $c = -9i + 40j$ and has 6 times its magnitude.

A. $\frac{54}{41}i - \frac{240}{41}j$

B. $-54i + 240j$

C. $\frac{-54}{41}i + \frac{240}{41}j$

D. $54i - 240j$

E. None of the above.

39. Find the exact value of the expression.

$$\cos^{-1}\left(\cos\left(\frac{5\pi}{4}\right)\right)$$

A. $\frac{\pi}{4}$

B. $\frac{3\pi}{4}$

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

D. $\frac{5\pi}{4}$

E. None of the above

40. Assume that the length of the major axis of a planet's orbit is 190,000,000 miles and that the eccentricity is 0.037. What is the minimum distance between the planet and the sun?

A. 182,970,00 0 miles
B. 197,030,00 0 miles
C. 98,515,000 miles
D. 91,485,000 miles
E. None of the above

41. Scientists sometimes use the formula $f(t) = a\sin(bt + c) + d$ to simulate temperature variations during the days, with time *t* in hours, temperature *f(t)* in °C, and *t* = 0 corresponding to midnight. Assume that *f(t)* is decreasing at midnight.

One day last year, the high temperature was 28°C, and the low of temperature of 20°C occurred at 6 am. What was the temperature at noon (*t* = 12)??

A. 26°
B. 22°
C. 28°
D. 24°
E. 20°

42. Find all solutions of the equation using *n* as an arbitrary integer.

$$\sin\left(2x - \frac{\pi}{4}\right) = 1$$

A. $x = \frac{3\pi}{8} + \frac{\pi}{2}n$
B. $x = \frac{\pi}{8} + \frac{\pi}{2}n$
C. $x = \frac{3\pi}{8} + \pi n$
D. $x = \frac{\pi}{8} + \pi n$
E. None of the above

43. Find the solution of the equation in the interval $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$.

$$5\sin^2\theta + 3\sin\theta - 1 = 0$$

A. $1.2408, -0.7918$
B. $0.2408, -0.9946$
C. $1.3300, -0.5654$
D. $0.2385, -0.8385$
E. None of the above

44. Find the standard form of the equation for the parabola with
Vertex (3, –1) and Focus (3, 2)

A. $(x-3)^2 = 12(y+1)$
B. $(x-3)^2 = 4(y+1)$
C. $(y+1)^2 = 12(x-3)$
D. $(y+1)^2 = 4(x-3)$
E. None of the above

45. Find the standard form of the equation of the parabola that satisfies the given conditions: Vertex $V(-9, 6)$, axis parallel to the x-axis, and passing through the origin.

A. $(y-6)^2 = 4(x+9)$
B. $(x+9)^2 = \frac{-27}{2}(y-6)$
C. $(y-6)^2 = \frac{27}{2}(x+9)$
D. $(x+9)^2 = -4(y-6)$
E. None of the above

46. Find the angle that is equivalent to $145°12'17''$ rounded to $0.0001°$.

A. 145.1217°
B. 145.1832°
C. 145.2047°
D. 145.2142°
E. None of the above

Answers:

1.	C		17.	C		32.	D
2.	E		18.	D		33.	D
3.	C		19.	A		34.	A
4.	C		20.	B		35.	C
5.	E (-4/3)		21.	B		36.	C
6.	A		22.	A		37.	A
7.	B		23.	D		38.	B
8.	C		24.	D		39.	B
9.	A		25.	A		40.	D
10.	I, IV		26.	C		41.	D
11.	A		27.	B		42.	C
12.	C		28.	A		43.	B
13.	B		29.	B		44.	A
14.	B		30.	C		45.	A
15.	C		31.	C		46.	C
16.	E ($3\pi/2$)						