MA 154 PRACTICE QUESTIONS FOR THE FINAL 6/00

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 these.

2. The angles with measures listed are all coterminal except
   A. $\pi/3$ B. $-5\pi/3$ C. $-300°$ D. $420°$ E. $-60°$

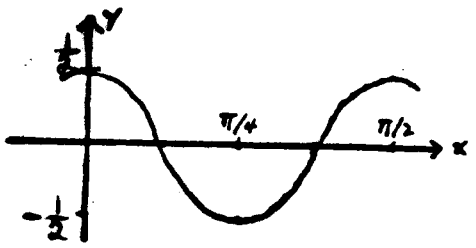
3. The radian measure of an angle of $135°$ is:
   A. $5\pi/4$ B. $3\pi/2$ C. $3\pi/4$ D. $7\pi/8$ E. None of these.

4. Use a calculator to find the $\sec 126°$ correct to 4 decimal places.
   A. 1.2361 B. -0.5878 C. -1.7013 D. -1.2361 E. None of these.

5. The point $(12,-16)$ is on the terminal side of the angle θ. Find $\tan\theta$.
   A. 5/3 B. $-5/4$ D. 4/3 C. 4/5 E. None of these.

6. If the diameter of a circle is 4, find the length of arc cut off by a central angle of $30°$.
   (Give your answer to 3 decimal places.)
   A. 1.047 B. 2.361 C. 3.142 D. 3.681 E. None of these.

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



   A. $y = \frac{1}{2}\cos\frac{1}{4}x$ B. $y = 4\cos\frac{1}{2}x$ C. $y = -\frac{1}{2}\sin 4x$ D. $y = \frac{1}{2}\cos 4x$ E. $y = -\frac{1}{2}\cos\frac{1}{4}x$

8. The graph of $y = 3 + \sin x$
   I. crosses the y-axis at 3; II. crosses the x-axis at multiples of π; III. is always above the x-axis; IV. has period 2π. (Choose all the correct answers.)

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

9. 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 these.

10. 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 these.

11. The expression $\dfrac{\tan^2 x}{1 + \sec x}$ is identically equal to
    A. 1 B. $\sec x - 1$ C. $\tan x + \sin x$ D. $\tan^2 x + \sin x \tan x$ E. $\csc x + \sin x$

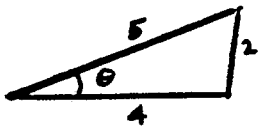
12. Simplify $\dfrac{\tan x \cos x \csc x}{\cot x \sec x \sin x}$:
A. $\tan^2 x \cos^2 x \sin^2 x$ B. 1 C. $\csc^2 x$ D. 0 E. $\tan^2 x$

13. Reduce to a single term: $\cos(2A+B)\cos B + \sin(2A+B)\sin B$
A. $\cos A$ B. $\cos B$ C. $\cos 2A$ D. $\cos 2B$ E. None of these.

14. Find all solutions of $3\cos^2 x + 2\sin x + 2 = 0$ in the interval $[0, 2\pi)$.
A. $x = 0, \pi/2$ B. $x = \pi/4, \pi/2$ C. $x = \pi/2$ D. $x = \pi/4$ E. None of these.

15. 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 these.

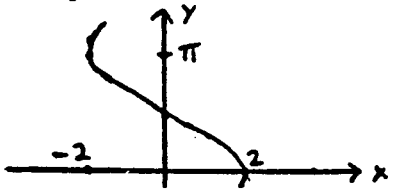
16. Find $\cos\theta$ in the figure given on the right.



A. 37/20 B. 7/40 C. 5/16
D. 37/40 E. None of these.

17. Given $\cos\theta = 3/4$ and $270° < \theta < 360°$, find $\sin 2\theta$.
A. $\dfrac{-3\sqrt{7}}{8}$ B. $\dfrac{-\sqrt{7}}{4}$ C. $\dfrac{-1}{8}$ D. $\dfrac{1}{8}$ E. $\dfrac{3\sqrt{7}}{8}$

18. Which equation best describes the graph given below?



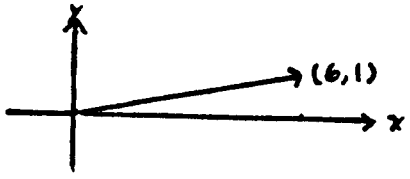
A. $y = 2\tan x$ B. $y = \cos^{-1} x/2$ C. $y = 2\cos^{-1} x$ D. $y = \sin^{-1} x/2$ E. $y = \cot 2x$.

19. Find $\cos[2\arcsin(4/5)]$.
A. 7/25 B. $-7/25$ C. 32/25 D. $-32/25$ E. None of these.

20. Point A is 2.0 miles north of B. The bearing from A to C is S 35° W and the bearing from B to C is S 86° 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 these.

21. Find the magnitude of the vector $< 2, 3 >$.
A. $\sqrt{6}$ B. 6 C. 5 D. $\sqrt{13}$ E. None of these.

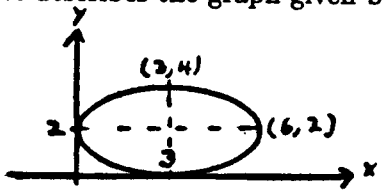
22. If $\vec{a} =< 2, 2 >$ and $\vec{b} =< -2, 3 >$, the sketch below corresponds to:



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 these.

23. If 6.0 lb, 110° is the magnitude and direction of one force and 2.0 lb, 200° 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. 6.3 lb, 128° B. 5.7 lb, 182° C. 6.3 lb, 182° D. 8.0 lb, 182° E. None of these.

24. Which equation best describes the 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. $\frac{(x-2)^2}{9}+\frac{(y-3)^2}{4}=1$

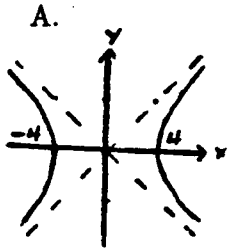
25. Classify the equations given below.

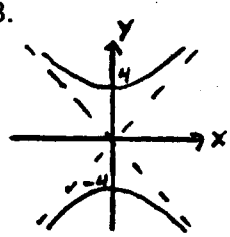
I. $x^2-y^2+2x=15$ II. $x^2+y^2+4x-2y-5=0$ III. $x^2-4x+y-7=0$

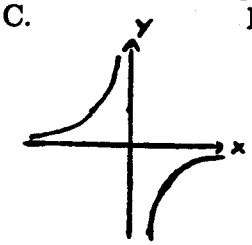
	I.	ellipse	*I.*	hyperbola	*I.*	hyperbola	*I.*	parabola
A.	*II.*	circle	*B.* *II.*	circle	*C.* *II.*	ellipse	*D.* *II.*	ellipse
	III.	parabola	*III.*	parabola	*III.*	parabola	*III.*	hyperbola

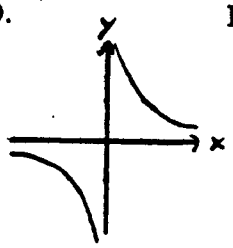
E. None of these.

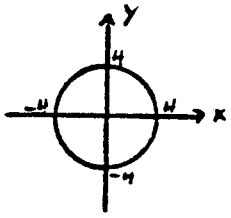
26. The graph of $x^2-y^2=16$ most closely resembles which graph sketched below?

A. 

B. 

C. 

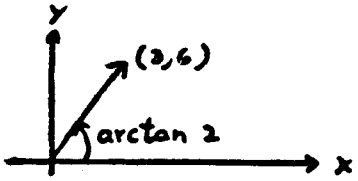
D. 

E. 

27. Express the complex number $\frac{2-i}{-3+i}$ in the form $a+bi$.

A. $\frac{-2}{3}-i$ B. $\frac{-5}{8}+\frac{1}{8}i$ C. $-\frac{1}{2}+\frac{1}{10}i$ D. $\frac{-7}{8}+\frac{1}{8}i$ E. None of these.

28. The complex number represented geometrically below is which of these trigonometric forms?



A. $45(\cos(\arctan 2)+i\sin(\arctan 2))$ B. $3\sqrt{5}(\sin(\arctan 2)+i\sin(\arctan 2))$
C. $3\sin(\arctan 2)+6\cos(\arctan 2)$ D. $3\sqrt{5}(\cos(\arctan 2)+i\sin(\arctan 2))$ E. None of these.

29. Express the complex number $2(\cos 45°+i\sin 45°)$ in the form $a+bi$.

A. $\sqrt{2}+\sqrt{2}i$ B. $\frac{1}{\sqrt{2}}+\frac{i}{\sqrt{2}}$ C. $\frac{1}{\sqrt{2}}-\frac{i}{\sqrt{2}}$ D. $\sqrt{2}-\sqrt{2}i$ E. None of these.

30. $(-i)^{53}=$

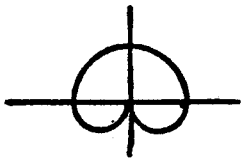
A. i B. $-i$ C. 1 D. -1 E. None of these.

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

A. $(-2,2)$ B. $(-4,2)$ C. $(2,-4)$ D. $(4,-2)$ E. $(2,-2)$

32. An arch of a bridge over a roadway is semielliptical with major axis horizontal. The base of the arch is 30 feet across and the 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. 9.9 feet

33. Which polar equation best describes the graph given below?



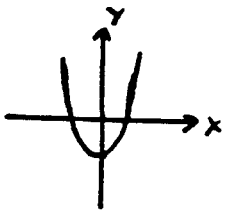
A. $r = (1 + \sin\theta)$ B. $r = (1 + \cos\theta)$ C. $r = (1 - \sin\theta)$ D. $r = 2\cos\theta$ E. $r = 2\sin\theta$

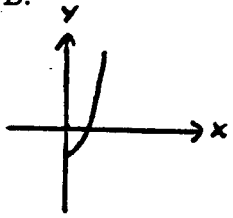
34. Give polar coordinates of a point whose rectangular coordinates are $(-2, 3)$.
A. $(\sqrt{13}, -56.3°)$ B. $(\sqrt{13}, 123.7°)$ C. $(13, -33.7°)$ D. $(13, 146.3°)$ E. $(\sqrt{13}, 146.3°)$

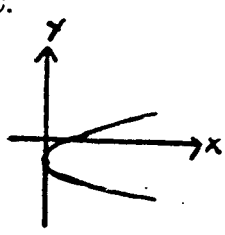
35. Find a polar equation which has the same graph as the equation $x^2 - 2x + y^2 = 0$.
A. $r = 1$ B. $r = 2$ C. $r = 2\sin\theta$ D. $r = 2\cos\theta$ E. $r = \sqrt{2\cos\theta}$

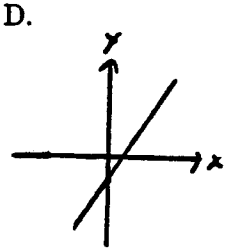
36. Find an equation in x and y for the curve whose parametric equations are $x = t+1$, $y = t^2 - 1$, t in $\mathbb{R}$.
A. $x = y^2 + 1$, y in $\mathbb{R}$ B. $x = y + 2$, y in $\mathbb{R}$ C. $y = x^2 - 1$, x in $\mathbb{R}$ D. $y = x^2 - 2x - 1$, x in $\mathbb{R}$
E. $y = x^2 - 2x$, x in $\mathbb{R}$

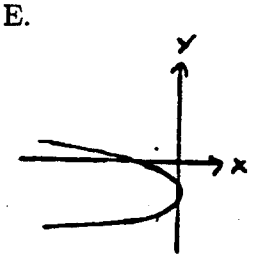
37. The graph of the parametric equations $x = t^2$, $y = 2t - 1$ t in $\mathbb{R}$, most closely resembles which graph sketched below?

A. 

B. 

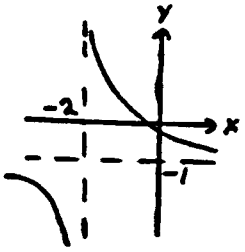
C. 

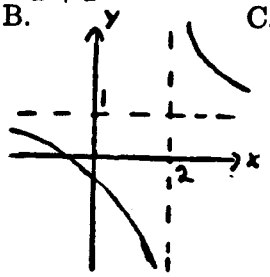
D. 

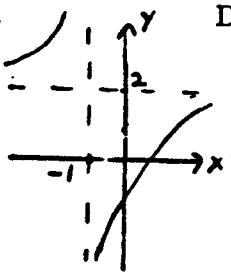
E. 

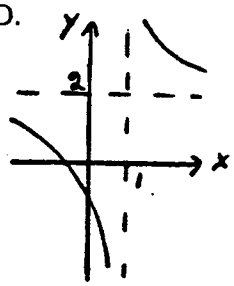
38. List all places where the graph of $f(x) = \dfrac{x^2 - 9}{x^2 + 2x}$ has vertical asymptotes.
A. $x = 0$ B. $x = 2$ C. $x = 0, x = -2$ D. $x = 3, x = -3$ E. None of these.

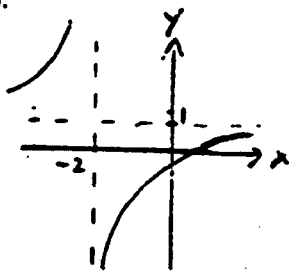
39. The graph of $f(x) = \dfrac{x-2}{x+2}$ most closely resembles which graph sketched below?

A. 

B. 

C. 

D. 

E. 

88. If the complex number $2 + 5i$ is written in trigonometric form, $r(\cos\theta + i\sin\theta)$, find r.

A. $r = \sqrt{29}$ B. $r = 29$ C. $r = \frac{2}{5}$ D. $r = 5$ E. None of these.

SOLUTION

1. C; 2. E.; 3. C; 4. C; 5. E [−4/3]; 6. A; 7. D; 8. B; 9. A; 10. C; 11. B; 12. B; 13. C; 14. E [$x = 3\pi/2$]; 15. C; 16. D; 17. A; 18. B; 19. B; 20. A; 21. D; 22. D; 23. A; 24. C; 25. B; 26. A; 27. E [$\frac{-7}{10} + \frac{1}{10}i$]; 28. D; 29. A; 30. B; 31. B; 32. C; 33. A; 34. B; 35. D; 36. E; 37. C; 38. C; 39. E; 40. A.

MA 154 FORMULA SHEET

ADDITION AND SUBTRACTION FORMULAS

$$\sin(u+v) = \sin u\cos v + \cos u\sin v \qquad \sin(u-v) = \sin u\cos v - \cos u\sin v$$

$$\cos(u+v) = \cos u\cos v - \sin u\sin v \qquad \cos(u-v) = \cos u\cos v + \sin u\sin v$$

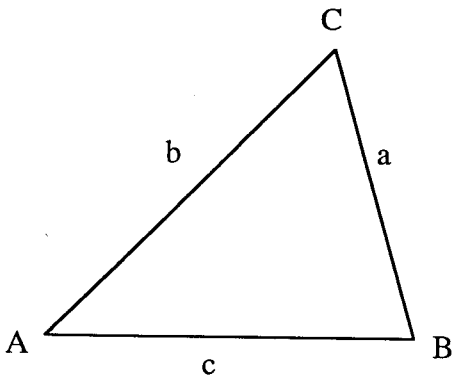
$$\tan(u+v) = \frac{\tan u + \tan v}{1 - \tan u\tan v} \qquad \tan(u-v) = \frac{\tan u - \tan v}{1 + \tan u\tan v}$$

PYTHAGOREAN IDENTITIES

$$1 + \tan^2\theta = \sec^2\theta \qquad 1 + \cot^2\theta = \csc^2\theta$$

HALF-ANGLE FORMULAS

$$\sin\left(\frac{\theta}{2}\right) = \pm\sqrt{\frac{1-\cos\theta}{2}} \qquad \cos\left(\frac{\theta}{2}\right) = \pm\sqrt{\frac{1+\cos\theta}{2}} \qquad \tan\left(\frac{\theta}{2}\right) = \frac{1-\cos\theta}{\sin\theta}$$



LAW OF SINES

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin B}$$

LAW OF COSINES

$$c^2 = a^2 + b^2 - 2ab\cos C$$

ANGLE BETWEEN TWO VECTORS

$$\cos\theta = \frac{(\vec{a})\bullet(\vec{b})}{\|\vec{a}\|\,\|\vec{b}\|}$$