MA 159 PRACTICE QUESTIONS FOR THE FINAL 1/04

1. Factor: $16x^2 - 4y^8$.
   A. $(4x - y^2)(4x + y^2)$ B. $(4x - 2y^4)^2$ C. $4(2x - y^4)(2x + y^4)$ D. $4(2x - y^2)$ E. None of these.

2. Simplify and write without negative exponents. (All letters denote positive real numbers.)
$$\left(\frac{36a^{-4}b^{10}c^2}{a^2c^{-6}}\right)^{-1/2}$$
   A. $\dfrac{a^3}{6b^5c^4}$ B. $-\dfrac{18a}{b^5c^2}$ C. $\dfrac{a}{6b^5c^2}$ D. $-\dfrac{6a^3}{b^5c^4}$ E. None of these.

3. Subtract and simplify: $\dfrac{3x}{3x+1} - \dfrac{x}{x-2}$.
   A. $\dfrac{2x^2 - 1}{(3x+1)(x-2)}$ B. $\dfrac{-3x^2}{(3x+1)(x-2)}$ C. $\dfrac{-7x}{(3x+1)(x-2)}$ D. $\dfrac{2x}{(3x+1)(x-2)}$
   E. None of these.

4. Simplify: $(2x+1)^3(2)(3x-5)(3) + (3x-5)^2(3)(2x+1)^2(2)$.
   A. $12(3x-5)(2x+1)^2(x+1)$ B. $6(3x-5)^2(2x+1)^3$ C. $6(3x-5)(2x+1)^2(6x^2-7x-5)$
   D. $6(3x-5)(5x-4)(2x+1)^2$ E. None of these.

5. Write without negative exponents: $\dfrac{xy^{-1}}{(x+y)^{-1}}$.
   A. $\dfrac{x(x+y)}{y}$ B. $\dfrac{x^2}{x+y}$ C. $\dfrac{x+y}{xy}$ D. $\dfrac{xy}{x+y}$ E. None of these.

6. If $A = P(1+rt)$, then $t =$
   A. $\dfrac{A-P}{r}$ B. $A - P$ C. $\dfrac{A-P}{P}$ D. $\dfrac{A}{P}$ E. None of these.

7. Solve for p : $\dfrac{4}{2p-3} + \dfrac{10}{4p^2-9} = \dfrac{1}{2p+3}$.
   A. $p = -\frac{3}{2}$ B. $p = \frac{5}{6}$ C. $p = -\frac{25}{6}$ D. There is no solution. E. None of these.

8. Rationalize the denominator: $\dfrac{\sqrt{x}+5}{\sqrt{x}-5}$.
   A. $\dfrac{x+10\sqrt{x}+25}{x-25}$ B. $\dfrac{x+25}{x-25}$ C. $\dfrac{x-25}{x-10\sqrt{x}+25}$ D. $\dfrac{x-25}{x+25}$ E. None of these.

9. A job takes 4 hours for two people working together. If one person works alone he can do the job in 6 hours. How long will it take the other person working alone to complete the job?
   A. 4 hrs. B. 6 hrs. C. 8 hrs. D. 10 hrs. E. None of these.

10. Let x and y be two consecutive positive integers such that x is less than y and the difference of their squares is 145. Find x.
    A. 73 B. 72 C. 12 D. 8 E. None of these.

11. A truck enters a freeway traveling 40 mph. One hour later a car enters the same freeway traveling 55 mph. After how many miles will the car overtake the truck?
    A. $146\frac{2}{3}$ miles B. $201\frac{2}{3}$ miles C. 120 miles D. $106\frac{2}{3}$ E. None of these.

12. How many ml of a 50% acid solution should be added to 40 ml of a 20% acid solution to obtain a solution that is 25% acid?
    A. 10 ml B. 8 ml C. 6 ml D. 4 ml E. None of these.

13. The base of a triangle is three inches more than its height. If each is increased by 3 inches the area is 14 square inches. Find the original base, b, and original height, h, in inches.
A. $b = 4, h = 1$ B. $b = 9, h = 6$ C. $b = 8, h = 5$ D. $b = \frac{7}{2}, h = \frac{1}{2}$ E. None of these.

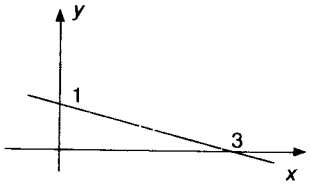
14. The value of a rare book is increasing linearly. It was worth \$54 in 1981 and \$62 in 1983. What is the formula for the value (v) of the book t years after 1980?
A. $v = 50 + 4t$ B. $v = 48 + 3t$ C. $v = 50 + 3t$ D. $v = 51 + 4t$ E. None of these.

15. Solve the inequality and express the solution in terms of intervals: $(4x - 3)(x + 7) \leq 0$.
A. $[-7, \frac{3}{4}]$ B. $(-\infty, -7] \cup [\frac{3}{4}, \infty)$ C. $[-7, \frac{4}{3}]$ D. $(-\infty, -7] \cup [\frac{4}{3}, \infty)$ E. None of these.

16. Solve the inequality: $| 6 - 2x | \leq 3$.
A. $x \geq \frac{3}{2}$ B. $x \leq \frac{3}{2}$ C. $\frac{3}{2} \leq x \leq \frac{9}{2}$ D. $-\frac{9}{2} \leq x \leq -\frac{3}{2}$ E. None of these.

17. If the point $(2, 3)$ is midway between A and B and the point A has coordinates $(1, -2)$, find the coordinates of the point B.
A. $(1, 5)$ B. $(3, 1)$ C. $(3, 8)$ D. $(\frac{3}{2}, \frac{1}{2})$ E. None of these.

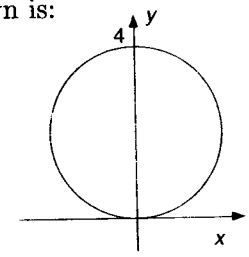
18. The slope of a line perpendicular to the line drawn is:



A. $\frac{1}{3}$ B. $-\frac{1}{3}$ C. -3 D. 3 E. None of these.

19. Give the equation of the line in slope-intercept form which is parallel to the line $2x - 3y = 7$ and contains the point $(2, -1)$.
A. $y = \frac{3}{2}x - 4$ B. $y = -\frac{2}{3}x + \frac{1}{3}$ C. $y = \frac{2}{3}x - \frac{7}{3}$ D. $y = \frac{2}{3}x + \frac{8}{3}$ E. None of these.

20. The equation for the circle shown is:



A. $x^2 + y^2 = 4$ B. $x^2 + y^2 - 4y = 0$ C. $x^2(y - 2) = 4$ D. $x^2 + y^2 + 4y = 0$
E. $x^2 + y^2 + 4x + 4y - 8 = 0$

21. Determine $(g \circ f)(x)$ for the following functions: $f(x) = 1 - \sqrt{x}$ and $g(x) = \frac{1}{x}$.
A. $-\sqrt{x}$ B. $1 - \sqrt{\frac{1}{x}}$ C. $1 - \sqrt{x}$ D. $\frac{1}{1 - \sqrt{x}}$ E. $\frac{1}{\sqrt{x}}$

22. If $f(x) = \frac{x}{x^2 + 1}$, find $\frac{1}{f(3)}$.
A. $\frac{3}{10}$ B. $\frac{3}{16}$ C. $\frac{16}{3}$ D. $\frac{10}{3}$ E. None of these.

23. If $f(x) = \dfrac{1}{3x-2}$, find the inverse function, $f^{-1}(x)$.

A. $f^{-1}(x) = 3x + 2$ B. $f^{-1}(x) = \dfrac{1+2x}{3x}$ C. $f^{-1}(x) = \dfrac{1}{2-3x}$ D. $f^{-1}(x) = \dfrac{3}{x+6}$

E. None of these.

24. If $f(x) = x^2 - 2x + 4$ then $\dfrac{f(x+h) - f(x)}{h} =$

A. $2x + h - 2$ B. $x + 2h - 2$ C. $x + 2h + 2$ D. $2x - h - 2$ E. $2x - h + 2$.

25. A square of side x is inscribed in a circle. Express the area, A, of the circle as a function of x.

A. $A = \frac{\pi}{2}x^2$ B. $A = x^2$ C. $A = \pi x^2$ D. $A = \frac{\pi}{4}x^2$ E. None of these.

26. An aquarium in the shape of a rectangular box is to have a height of 1.5 feet and a volume of 6 cubic feet. Let x denote the length of the base and y the width of the base. Express y as a function of x.

A. $y = 1.5x$ B. $y = \frac{4}{x}$ C. $y = x^2$ D. $y = \frac{6}{x}$ E. $y = 9x$

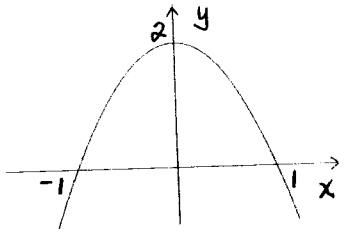
27. T varies directly as the cube of a and inversely as the square root of d. If $T = 4$ when $a = 2$ and $d = 9$, find T when $a = -1$ and $d = 4$.

A. $T = -\frac{3}{4}$ B. $T = -\sqrt[3]{3}$ C. $T = -3$ D. $T = \frac{3}{2}$ E. $T = -\frac{81}{256}$

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

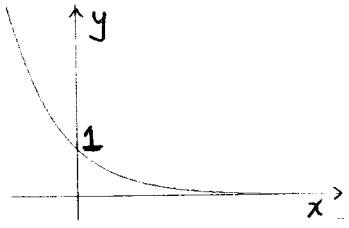
A. $(2, -2)$ B. $(2, -4)$ C. $(-4, 2)$ D. $(-2, 4)$ E. $(-2, 2)$

29. The graph below could best be described by which equation?



A. $y = 2x^2 + 2$ B. $y = -2x^2 + 2$ C. $y = -2x^2 - 2$ D. $y = 2x^2 - 2$ E. $y = -(x-2)^2$

30. The figure below most closely resembles the graph of which function?



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

31. Express as one logarithm: $\log_b y^3 + \log_b y^2 - \log_b y^4$.

A. $\log_b y^2$ B. $\log_b y$ C. $\log_b(y^3 + y^2 - y^4)$ D. $\log_b \dfrac{y^3 + y^2}{y^4}$ E. None of these.

32. Which are true of the function $f(x) = \log_a x$ if $a > 1$?

I. f is an increasing function. II. f has a as an x intercept. III. f has 1 as a y intercept. IV. The domain of f is $(0, \infty)$. List all correct answers.

A. I, II and III B. I and II C. II and IV D. I and IV E. I and III

33. Which of the following is equal to $\log\left(\dfrac{432}{\sqrt{.095}\sqrt[3]{72.1}}\right)$?

A. $\log 432 - \frac{1}{2}\log .095 - 3\log 72.1$ B. $\log 432 - \frac{1}{2}\log .095 - \frac{1}{3}\log 72.1$
C. $\log 432 - 2\log .095 + 3\log 72.1$ D. $\log 432 - \frac{1}{2}\log .095 + \frac{1}{3}\log 72.1$
E. $\log 432 - 2\log .095 - 3\log 72.1$

34. If $\log_x 2 = 5$, solve for x. Give you answer correct to four decimal places.
A. 2.2361 B. 1.4142 C. 0.6990 D. 1.1487 E. 0.3010

35. Evaluate: $\dfrac{\log_5 \frac{1}{8}}{\log_5 2}$.
A.-4 B. $-\frac{1}{3}$ C. $-\frac{1}{4}$ D. -3 E. None of these.

36. Solve for $x : 3^{x-5} = 4$.
A. $x = \log 4 + 5\log 3$ B. $x = 5 + \log(4/3)$ C. $x = 5 + \dfrac{\log 4}{\log 3}$
D. $x = 5 + \log 4$ E. $x = \dfrac{5 + \log 4}{\log 3}$

37. Solve for $x : \log_3 \sqrt{2x+3} = 2$.
A. $x = 5/2$ B. $x = 3/2$ C. $x = 39$ D. $x = 17$ E. $x = 3$

38. Given that $\log_3 m = 8, \log_3 n = 10$ and $\log_3 p = 6$. Calculate $\log_3\left(\dfrac{\sqrt{mn}}{p^3}\right)$.
A. -9 B. $\dfrac{2\sqrt{5}}{27}$ C. 22 D. -56 E. -4

39. A radioactive substance decays according to $q(t) = q_0 e^{-0.0063t}$ where q_0 is the initial amount of the substance and t is the time in days. Find the half-life of the substance to the nearest tenth of a day.
A. 110.0 days B. 47.8 days C. 0.5 days D. 2.0 days E. Cannot be determined.

40. The graph of $y = 2 + 2^x$ crosses the y-axis at:
A. 0 B. 1 C. 2 D. 3 E. 4

41. Determine where the graphs of the equations $x + 4y = 3$ and $2x - 6y = 8$ intersect.
A. $(-\frac{12}{5}, \frac{6}{5})$ B. $(\frac{1}{3}, \frac{4}{9})$ C. $(\frac{2}{7}, \frac{5}{7})$ D. $(\frac{1}{8}, \frac{2}{5})$ E. None of these.

42. Determine where the graphs of the equations $x^2 + y^2 = 16$ and $2y - x = 4$ intersect.
A. $(-4, 0), (\frac{12}{5}, \frac{16}{5})$ B. $(0, 2), (\frac{16}{5}, \frac{18}{5})$ C. $(-4, 0), (-\frac{7}{2}, \frac{1}{4})$ D. $(4, 0), (-\frac{12}{5}, \frac{16}{5})$ E. None of these.

43. Solve the following system of equations for z.

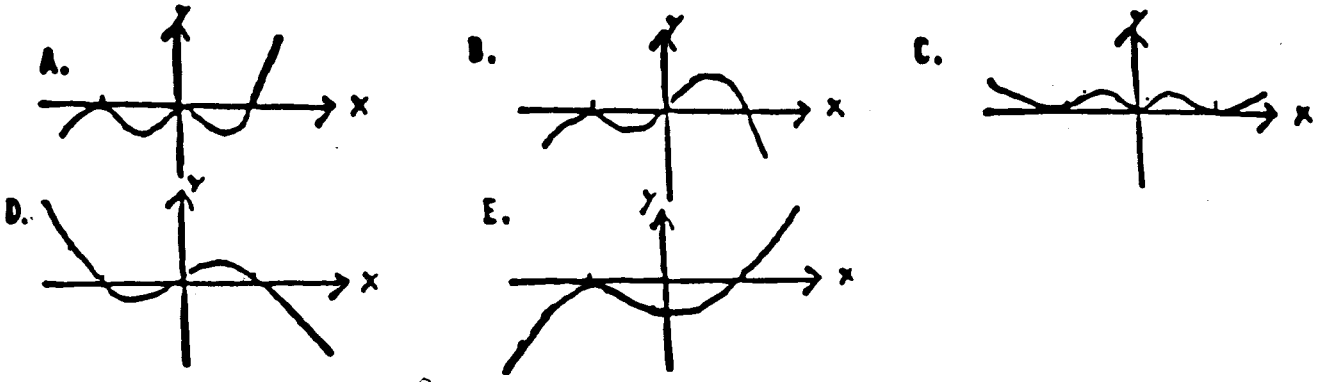
$$\begin{aligned} x + y - z &= -1 \\ 4x - 3y + 2z &= 16 \\ 2x - 2y - 3z &= 5 \end{aligned}$$

A. $z = \frac{13}{17}$ B. $z = 1$ C. $z = -2$ D. $z = -\frac{29}{27}$ E. $z = 2$

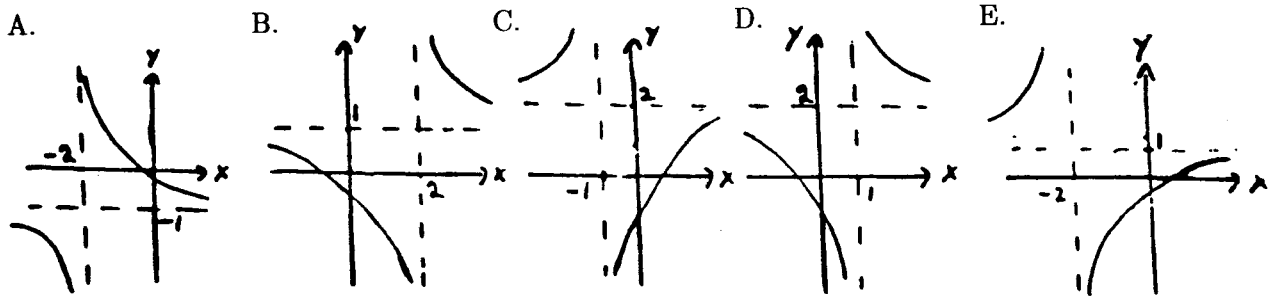
44. Find the quotient $q(x)$ and the remainder $r(x)$ if $x^4 - 2x^2 - 3$ is divided by $x^2 - 6x$.
A. $q(x) = x^2 - x + 5, r(x) = 3x + 2$ B. $q(x) = x^2 - 2, r(x) = x + 5$
C. $q(x) = x^2 + 6x + 34, r(x) = 204x - 3$ D. $q(x) = x^2 - 6x + 4, r(x) = 24x - 3$
E. None of these.

45. 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.

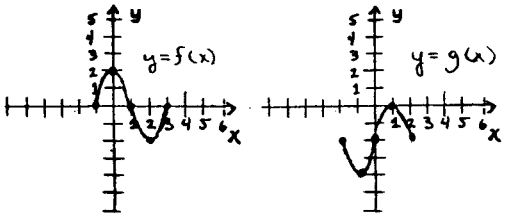
46. Which of the following looks most like the graph of $y = x^2(x-1)(x+1)^2$?



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



48. If the graphs of two functions f and g are as sketched below, which of the following is true?



A. $g(x) = -f(x-1) - 2$ B. $g(x) = f(-x-1) - 2$ C. $g(x) = -f(x+1) - 2$
D. $g(x) = -f(-x+1) - 2$ E. None of these.

49. 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.

50. The angles with measures listed are all coterminal except:
A. $\frac{\pi}{3}$ B. $-\frac{5\pi}{3}$ C. $-300°$ D. $420°$ E. $-60°$

51. 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 these.

52. 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.

53. 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 these.

54. Find the exact value of $\tan 120°$.
A. $-\sqrt{3}$ B. $-\frac{1}{\sqrt{3}}$ C. $\sqrt{3}$ D. $\frac{1}{\sqrt{3}}$ E. None of these.

55. 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.

56. 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.

57. 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.

58. 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. $\csc x + \sin x$

59. 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. $\tan^2 x$

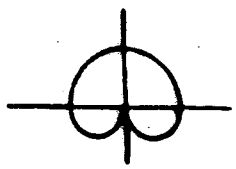
60. Given $\cos\theta = 3/4$ and $270° < \theta < 360°$, find $\sin 2\theta$.
A. $\dfrac{-3\sqrt{7}}{8}$ B. $\dfrac{-\sqrt{7}}{4}$ C. $\dfrac{-1}{8}$ D. $\dfrac{1}{8}$ E. $\dfrac{3\sqrt{7}}{8}$

61. Given $\tan\theta = \sqrt{5}/2$ and $180° < \theta < 270°$, find $\cos\theta/2$.
A. $-\sqrt{\dfrac{1 + \frac{\sqrt{5}}{3}}{2}}$ B. $-\sqrt{\dfrac{1 - \frac{2}{3}}{2}}$ C. $\sqrt{\dfrac{1 - \frac{2}{\sqrt{3}}}{2}}$ D. $-\sqrt{\dfrac{1 - \frac{\sqrt{5}}{3}}{2}}$ E. $\sqrt{\dfrac{1 - \frac{2}{3}}{2}}$

62. A wire is attached to the top of a radio antenna and to a point on horizontal ground that is 40.0 meters from the base of the antenna. If the wire makes an angle of $58°20'$ with the ground, approximate the length of the wire to the nearest tenth of a meter.
A. 47.0 m B. 76.2 m C. 47.1 m D. 75.9 m E. None of these.

63. 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.

64. 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. $r = 2\sin\theta$

65. 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. $(\sqrt{13}, 146.3°)$

66. 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. $r = \sqrt{2\cos\theta}$

SOLUTION

1. C; 2. A; 3. C; 4. D; 5. A; 6. E $[(A - P)/Pr]$; 7. C; 8. A; 9. E [12 hrs]; 10 B; 11 A; 12. B; 13. A; 14. A; 15. A; 16. C; 17. C; 18. D; 19. C; 20. B; 21. D; 22. D; 23. B; 24. A; 25. A; 26. B; 27. A; 28. B; 29. B; 30. A; 31. B; 32. D; 33. B; 34. D; 35. D; 36. C; 37. C; 38. A; 39. A; 40. D; 41. E $[(\frac{25}{7}, -\frac{1}{7})]$; 42. A; 43. B; 44. C; 45. C; 46. A; 47. E; 48. C; 49. C; 50. E; 51. C; 52. C; 53. E $[-\frac{4}{3}]$; 54. A; 55. A; 56. B; 57. A; 58. B; 59. B; 60. A; 61. B; 62. B; 63. C; 64. A; 65. B; 66. D.