MA 158 PRACTICE QUESTIONS FOR THE FINAL 5/12

1. 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 the above.

2. 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 the above.

3. 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 the above.

4. 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 the above.

5. 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 the above.

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

7. If $f(x) = \dfrac{x}{x^2+1}$, find $\dfrac{1}{f(3)}$.
   A. $\dfrac{3}{10}$ B. $\dfrac{3}{16}$ C. $\dfrac{16}{3}$ D. $\dfrac{10}{3}$ E. None of the above.

8. 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 the above.

9. 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. $2x - h + 2$.

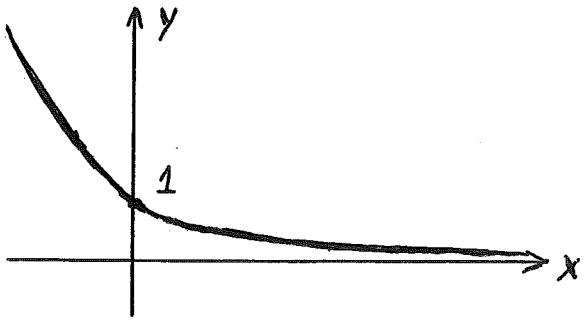
10. A square of side x is inscribed in a circle. Express the area, A, of the circle as a function of x.
    A. $A = \frac{\pi}{2}x^2$ B. $A = x^2$ C. $A = \pi x^2$ D. $A = \frac{\pi}{4}x^2$ E. None of the above.

11. 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. $y = 9x$

12. 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. $(-2, 2)$

13. Find an equation of a quadratic function whose graph has the points $(1, 0), (-1, 0)$ and $(0, 2)$.
    A. $y = 2x^2 + 2$ B. $y = -2x^2 + 2$ C. $y = -2x^2 - 2$ D. $y = 2x^2 - 2$ E. $y = -(x-2)^2$

14. 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. $y = 1 - 2^x$

15. 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 the above.

16. 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

17. 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. $\log 432 - 2\log .095 - 3\log 72.1$

18. 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

19. 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 the above.

20. 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. $x = \dfrac{5 + \log 4}{\log 3}$

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

22. 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

23. 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.

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

25. 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 the above.

26. 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 the above.

27. 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. $z = 2$

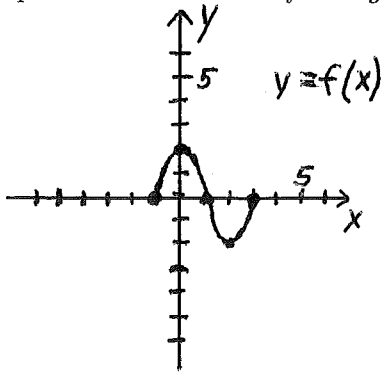
28. Find the quotient $q(x)$ and the remainder $r(x)$ if $x^4 - 2x^2 - 3$ is divided by $x^2 - 6x$.
A. $q(x) = x^2 - x + 5, r(x) = 3x + 2$ B. $q(x) = x^2 - 2, r(x) = x + 5$
C. $q(x) = x^2 + 6x + 34, r(x) = 204x - 3$ D. $q(x) = x^2 - 6x + 4, r(x) = 24x - 3$
E. None of the above.

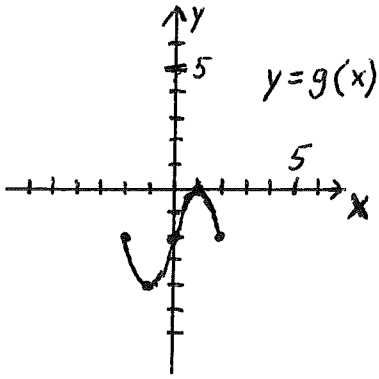
29. List all places where the graph of $f(x) = \dfrac{x^2 - 9}{x^2 + 2x}$ has vertical asymptotes.
A. $x = 0$ B. $x = 2$ C. $x = 0, x = -2$ D. $x = 3, x = -3$ E. None of the above.

30. Given $f(x) = x^2(x - 1)(x + 1)^2$. For what values of x is $f(x) < 0$?
A. $(-\infty, -1) \cup (-1, 0) \cup (0, 1)$ B. $(-\infty, -1) \cup (-1, 0) \cup (1, \infty)$ C. $(-1, 0) \cup (1, \infty)$ D. $(-\infty, -1) \cup (-1, 1)$ E. None of the above.

31. Considering the graph of $f(x) = \dfrac{x - 2}{x + 2}$, which statement is true?
A. $f(x)$ is decreasing and has a Range of $(-\infty, -1) \cup (-1, \infty)$
B. $f(x)$ is decreasing and has a Range of $(-\infty, 1) \cup (1, \infty)$
C. $f(x)$ is increasing and has a Range of $(-\infty, 2) \cup (2, \infty)$
D. $f(x)$ is decreasing and has a Range of $(-\infty, 2) \cup (2, \infty)$
E. $f(x)$ is increasing and has a Range of $(-\infty, 1) \cup (1, \infty)$

32. 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 the above.

33. 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.

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

35. 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.

36. 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 the above.

37. 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.

38. 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 the above.

39. 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 the above.

40. 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 the above.

41. 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.

42. 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. $\csc x + \sin x$

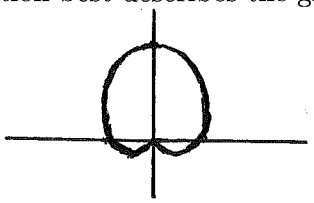
43. Simplify: $\dfrac{\tan x \cos x \csc x}{\cot x \sec x \sin x}$.
A. $\tan^2 x \cos^2 x \sin^2 x$ B. 1 C. $\csc^2 x$ D. 0 E. $\tan^2 x$

44. 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. $\dfrac{3\sqrt{7}}{8}$

45. 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 the above.

46. 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.

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

48. 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. $(\sqrt{13}, 146.3°)$

49. 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. E [12 hrs]; 2. B; 3. A; 4. B; 5. A; 6. D; 7. D; 8. B; 9. A; 10. A; 11. B; 12. B; 13. B; 14. A; 15. B; 16. D; 17. B; 18. D; 19. D; 20. C; 21. C; 22. A; 23. A; 24. D; 25. E $[(\frac{25}{7}, -\frac{1}{7})]$; 26. A; 27. B; 28. C; 29. C; 30. A; 31. E; 32. C; 33. C; 34. E; 35. C; 36. C; 37. E $[-\frac{4}{3}]$; 38. A; 39. A; 40. B; 41. A; 42. B; 43. B; 44. A; 45. B; 46. C; 47. A; 48. B; 49. D.