

- Which of the following is NOT a solution for  $\frac{2}{x+4} \geq -1$ ?  
 A)  $-10$       B)  $-6$       C)  $-5$       D)  $-2$       E)  $0$
- The graph of  $3y^2 + 12y + x + 16 = 0$  is  
 A) a parabola, opening right, with vertex at  $(4, -2)$   
 B) a parabola, opening right, with vertex at  $(-2, 4)$   
 C) a parabola, opening left, with vertex at  $(-4, -2)$   
 D) a parabola, opening left, with vertex at  $(-2, -4)$   
 E) none of these
- Given that  $\begin{bmatrix} 2 & 1 \\ 3 & -1 \end{bmatrix} \cdot \begin{bmatrix} j & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ k & -10 \end{bmatrix}$ , find  $3j + 5k$ .  
 A)  $11$       B)  $\frac{51}{2}$       C)  $29$       D)  $49$       E) none of these
- What would be the approximate dollar value of a straight trail of pennies from Borough of Manhattan CC in New York to Pasadena City College in California, where each penny is horizontal and tangent to the previous penny in the trail?  
 A) \$ 200 000      B) \$ 2 000 000      C) \$ 20 000 000      D) \$ 200 000 000      E) \$ 2 000 000 000
- The mean of four numbers is 107, the median is 83, and the mode is 51. Find the range.  
 A) 160      B) 184      C) 187      D) 211      E) 262
- Which of the following is NOT equivalent to  $\cos\left(\frac{3\pi}{2} + x\right)$ ?  
 A)  $\sin x$       B)  $\cos\left(x - \frac{\pi}{2}\right)$       C)  $\cos\left(\frac{\pi}{2} - x\right)$       D)  $\sin(2\pi - x)$       E)  $\sin(\pi - x)$
- How many different scores are possible for an individual taking this exam? (It's OK to refer back to the instructions!)  
 A) 94      B) 95      C) 96      D) 100      E) 101
- If  $f$  is a linear function such that  $f(3) = 0$  and  $f(10) \neq 0$ , find  $\frac{f(-2) + f(0) + f(8)}{f(1) + f(5) + f(6)}$   
 A)  $-1$       B)  $0$       C)  $\frac{1}{2}$       D)  $1$       E)  $3$
- Six cards each have one letter printed on each side of the card. The table below shows the letters that are on each card. (For example, the first card has an A on one side and an M on the other.)
 

A	A	A	A	Y	B
M	T	Y	C	C	T

The six cards are tossed into the air and fall randomly to the ground. What is the probability that the resulting letters can be arranged to spell AMATYTC?

 A)  $\frac{1}{64}$       B)  $\frac{1}{32}$       C)  $\frac{1}{16}$       D)  $\frac{1}{8}$       E) none of these
- The distance from the vertex of  $x + 2y^2 + 8y + 3 = 0$  to the center of  $x^2 + 2y^2 - 4y = 3$  is  
 A)  $\sqrt{26}$       B)  $\sqrt{34}$       C)  $6$       D)  $\sqrt{58}$       E)  $8$

11. Suppose that  $P$  and  $Q$  are both fourth degree polynomial functions, each having four distinct real zeros but with three zeros in common. Then the graph of  $y = \frac{P(x)}{Q(x)}$  lies on  
 A) a line    B) a parabola    C) a hyperbola    D) a semi-circle    E) none of these
12. Given that  $\cos B = -\frac{2}{7}$ ,  $\sin B < 0$ , and  $0 < B < 2\pi$ , find  $\cos^{-1}\left(-\frac{2}{7}\right)$  in terms of  $B$ .  
 A)  $B$     B)  $2\pi - B$     C)  $-B$     D)  $B - \pi$     E) none of these
13. A  $3 \times 3$  magic square uses the integers  $1, 2, \dots, 9$  once each in such a way that each column, each row, and each diagonal sums to 15. Find the value of  $n$  for the magic square, a portion of which is shown below.

	1	
$n$		
		4

- A) 2    B) 5    C) 6    D) 7    E) 8
14. On a trip to the post office, Jorge spent \$ 6.91 on 32-cent and 23-cent stamps. How many stamps did he buy?  
 A) 22    B) 23    C) 24    D) 25    E) 26
15. Let  $f(x) = \begin{cases} 22 - 3^x & \text{if } x \geq 3 \\ -\frac{5}{3}x & \text{if } -3 < x < 3 \\ 2^{-x} - 3 & \text{if } x \leq -3 \end{cases}$ . Find  $f^{-1}(10)$ .  
 A)  $-6.5$     B)  $-\ln(6.5)$     C)  $\log_3 12$     D)  $-6$     E)  $-\log_2 13$
16. How many times does the graph of  $x^2y + xy^2 + 3xy + 5x - 7y = 5$  intersect the graph of  $y = 2x$ ?  
 A) 0    B) 1    C) 2    D) 3    E) 4
17.  $ABCD$  quadrilateral with  $AD = 10.0$ ,  $CD = 10.0$ ,  $\angle A = 118.00^\circ$ ,  $\angle B = 22.00^\circ$ , and  $\angle C = 130.00^\circ$ . Find  $BC$  accurate to three significant figures.  
 A) 18.8    B) 21.8    C) 23.4    D) 25.9    E) 36.1
18. For what values of  $k$  will the line  $x + 2y = k$  be tangent to the circle  $x^2 + y^2 = 9$ ?  
 A)  $\pm 5\sqrt{2}$     B)  $\pm 4\sqrt{3}$     C)  $\pm 3\sqrt{5}$     D)  $\pm 2\sqrt{6}$     E)  $\pm 2\sqrt{7}$
19. A circle with area one is surrounded by four squares, each with area one and each externally tangent to the circle at equally spaced points around the circle. Find the area, to the nearest hundredth of a square unit, of the circle circumscribing the four squares.  
 A) 8.47    B) 8.51    C) 8.59    D) 8.67    E) 8.72
20. What is the minimum value for  $n$  such that the probability that there is a birthday today among a group of  $n$  people is greater than or equal to 0.5?  
 A) 23    B) 128    C) 183    D) 253    E) 282

## Answers

- |     |   |     |   |
|-----|---|-----|---|
| 1.  | C | 11. | C |
| 2.  | C | 12. | B |
| 3.  | D | 13. | D |
| 4.  | B | 14. | B |
| 5.  | A | 15. | E |
| 6.  | D | 16. | D |
| 7.  | B | 17. | E |
| 8.  | A | 18. | C |
| 9.  | B | 19. | A |
| 10. | B | 20. | D |