

1. Given functions  $f(x) = 4x - 5$  and  $g(x) = \frac{2}{3x}$  which of the following would be equivalent to  $f(g(x))$ ? [6,708]

$$f\left(\frac{2}{3x}\right) = 4\left(\frac{2}{3x}\right) - 5 = \frac{8}{3x} - 5$$

- A.  $\frac{8}{3x} - 5$
- B.  $4x^2 - 5$
- C.  $\frac{2}{3(4x-5)}$
- D.  $-4$
- E.  $\left(\frac{1}{x}\right) - 5$

2. Given  $\sin\theta < 0$  and  $\tan\theta = -1$  what is  $\theta$ . [6,704]

$$\tan^{-1}(-1) = \frac{7\pi}{4} \quad \frac{\sqrt{2}}{2} / \frac{\sqrt{2}}{2}$$

- or -  
 plug the answers in!

- F.  $\frac{\pi}{4}$
- G.  $\frac{7\pi}{6}$
- H.  $\frac{4\pi}{3}$
- J.  $\frac{3\pi}{2}$
- K.  $\frac{7\pi}{4}$**

3. Solve  $\log 2^x + \log 8 = \log 64$  for x. [6,707]

$$\log 2^x + \log 8 = \log 64$$

$$\log(2^x \cdot 8) = \log 64$$

$$\frac{2^x \cdot 8}{8} = \frac{64}{8}$$

$$2^x = 8 \quad x = 3 \quad (2^3 = 8)$$

- A.  $\sqrt{8}$
- B. 3**
- C. 2
- D.  $1/3$
- E. 0

4. Which of the below are equivalent to  $e \log 10^4$  [6,707]

$$e \cdot \log 10^4 \quad (\log_{10} 10 = 1)$$

$$4e$$

4e

- F. 40000
- G.  $e^4$
- H.  $4e \ln e^x$**
- J.  $40e$
- K. no solution

5. If the point (0, 2) is your starting point and (1,4) is next, followed by (2,8) write an exponential growth equation for this data: [6,702]

if 0 is plugged in for x, you get 0 for y for all answers except B

$$y = 2(2)^0 = 2$$

- A.  $y = 2(2x)^2$
- B.  $y = 2(2)^x$**
- C.  $y = 2(x)^2$
- D.  $y = 2(2x)$
- E.  $y = 2(x)^3$

6. Sue has made a drawing using math functions. Her parabola  $y = (x+1)^2 - 2$  needs to be moved one spot to the right and up three spots. Which of these would work? [16,706]

F.  $y = (x+1)^2 + 1$

**G.  $y = x^2 + 1$**        $y = (x+1-1)^2 - 2 + 3$   
right up

H.  $y = x^2 + 8x + 11$

J.  $y = x^2 + 4x + 5$

K.  $y = (x+2)^2 - 5$

7. In a geometric sequence with a starting value of 3 and a common ratio between terms of 1.7, what is the 14th term, rounded to the nearest whole number? [6,703]

A. 27

B. 1683

**C. 2971**       $3(1.7^{13}) = 2971$

D. 5051

E.  $3^{14}$

$\frac{3}{1}, \frac{5.1}{2}, \frac{8.67}{3}, \dots, \frac{2971}{14}$

8. Given the general equation for a parabola  $y = ax^2 + a$ , if  $a > 0$  which of the following statements must be true of the parabola?

- I. The y intercept must be positive
  - II. The roots are positive
  - III. The vertex is above the x axis. [16,705]
- F. I is true and II and III are false  
 G. II is true and I and III are false  
 H. I and II are true  
 J. II and III are true  
**K. I and III are true**

9. The graph of a certain trig function has a y intercept of 1. Which of the following answers would fit this situation? [6,705]

- A. both  $y = \cos x$  and  $y = \sin(x + 2)$
- B. both  $y = \cos x$  and  $y = \tan x$
- C. both  $y = \sin x$  and  $y = \cos x + 1$
- D. both  $y = \tan x$  and  $y = \sin x$
- E. both  $y = \tan x + 1$  and  $y = \sin x + 1$**

10. Find the mean, median and mode for the following data set: {24,24,24,29,30,41} ? Round to the tenths place. [19,701]

F. mean: 29, median: 27, mode: 24

G. mean: 28.7, median: 24,29 mode: 24

**H. mean: 28.7, median: 26.5, mode: 24**

J. mean: 26.5, median: 28.7, mode: 24

K. none of the above are correct

mean:  $\frac{24+24+24+29+30+41}{6} = 28.7$   
 median:  $\frac{24+24}{2} = 24$   
 mode: 24

11. Gas prices decreased from year 1 to year 2 by 3%. From year 2 to year 3 they increased by 6%. If in year 3 they were \$3.99, what was the price in year 1? [16,701]

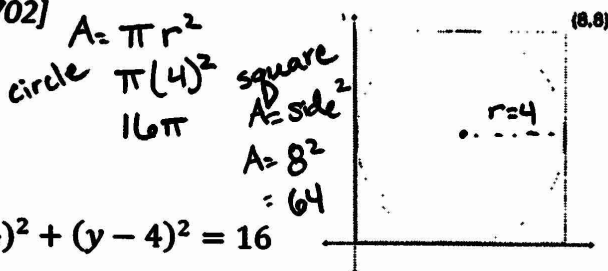
- A. \$3.50  
B. \$3.62  
C. \$3.88  
D. \$3.89  
E. \$4.40

$$3.99 / 1.06 = 3.764 \dots$$

$$3.76 / 0.97 = 3.876 \rightarrow \$3.88$$

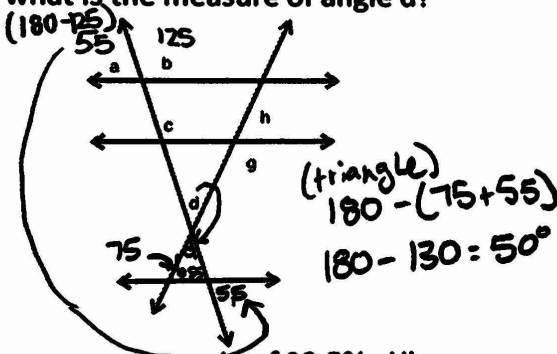
12. A circle is circumscribed in a square with sides of 8 units. What is the probability that a dart thrown at the square will hit outside of the circle? [7,702]

- F. .785  
G. .215  
H. .196  
J. .151  
K.  $(x-4)^2 + (y-4)^2 = 16$



13. Given the three horizontal lines that appear to be parallel ARE parallel, and angle b is  $125^\circ$  and angle e is  $75^\circ$ , what is the measure of angle d? [7,704]

- A.  $50^\circ$   
B.  $55^\circ$   
C.  $60^\circ$   
D.  $65^\circ$   
E.  $80^\circ$



14. Josh has an average test grade of 93.5%. His homework counts for 15% of his grade and his tests count for 85%. Given that he performs 30% better on his tests than his homework, what was his weighted average? [19,601]

- F. 91.5%  
G. 90%  
H. 89.5%  
J. 89%  
K. 87.5%

$$93.5 \cdot 85 = 79.475$$

$$63.5 \cdot 15 = 9.525$$

$$\underline{\hspace{1.5cm}} 89$$

15. A line segment has an endpoint of (2,3) and a midpoint of (5.5,a). Its other endpoint? [7,511]

- A. (8,3a)  
B. (8,3+a)  
C. (9,3+a)  
D. (9,3+2a)  
E. (9,2a-3)

$$5.5 - 2 = 3.5$$

$$5.5 + 3.5 = 9$$

$$2(a-3) + 3 = 2a - 6 + 3$$

$$2(\text{difference}) + \text{original} = 2a - 3$$

$$(9, 2a-3)$$

16. The polynomial  $f(x) = x^3 + 2x^2 - 2$  is divided by  $x-1$ . What is the remainder? [1,703]

- F. -1  
G. 0  
H. 1  
J. 4  
K.  $x^2 - 3x$

$$x-1 \overline{) x^3 + 2x^2 + 0x - 2}$$

$$\underline{-(x^2 - x^2)} \quad R1$$

$$3x^2 + 0x$$

$$\underline{-(3x^2 - 3x)}$$

$$3x - 2$$

17. The inequality  $x^2 - 4 \leq 0$  yields which of the following solution sets? [1,702]

- A.  $-2 \leq x \leq 2$   
B.  $0 \leq x \leq 2$   
C.  $2 \leq x \leq -2$   
D.  $-2 \leq x$   
E. there is no solution

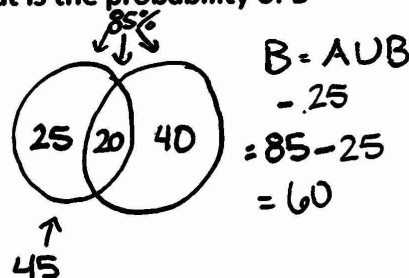
$$(x-2)(x+2) \leq 0$$

$$x \leq 2$$

$$x \leq -2$$

18. The Probability of  $A \cup B$  is 85%. The probability of  $A \cap B$  is 20%. The probability of A is 45%. What is the probability of B (p(B)). [19,704]

- F. 30%  
G. 40%  
H. 60%  
J. 70%  
K. 80%



$$A - A \cap B = 45 - 20 = 25$$

19. At Samantha's Smoothies, they make a blended treat by combining 2 of 4 kinds of ice cream with 1 of 5 kinds of fruit. How many different smoothies can be made? [19,603]

- A. 10  
B. 25  
C. 30  
D. 60  
E. 120

ice-cream: w, x, y, z  
wx xy yz  
wy xz yz  
wz

6 options of 2 flavors  
fruit: 5 options of 1 flavor  
 $6 \cdot 5 = 30$

20. Use Trig Identities to simplify  $\frac{1}{\cot \theta \sin \theta}$ : [6,706]

- F.  $\sin \theta$   
G.  $\sec \theta$   
H.  $\tan \theta$   
J.  $\cot \theta$   
K.  $\csc \theta$

$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

$$\frac{1}{\frac{\cos \theta}{\sin \theta} \cdot \sin \theta} = \frac{1}{\cos \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$