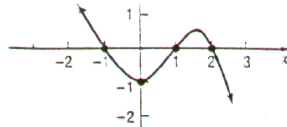
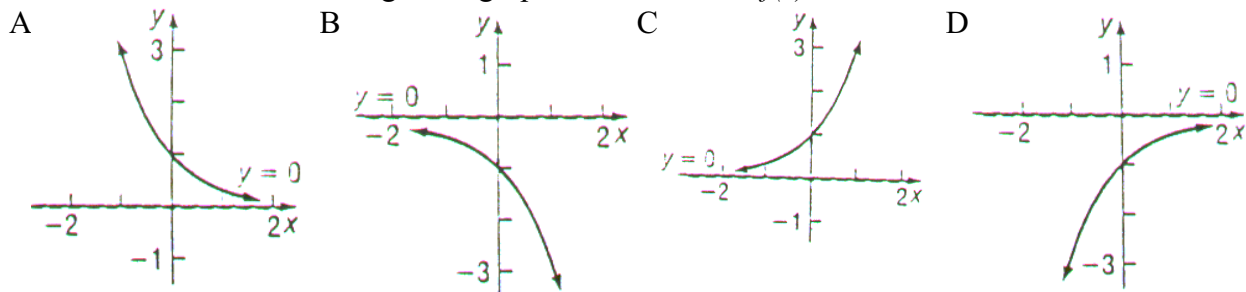


## Questions

2. The domain of the function  $f(x) = \sqrt{2-x}$  is the set of numbers  $x$  satisfying:  
 (A)  $x \leq 2$     (B)  $x \neq 2$     (C)  $x \geq 2$     (D) all real numbers
3. Consider the functions  $f(x) = x^3 + x^2$  and  $g(x) = x^2 + 1$ . Then  
 (A)  $f$  and  $g$  are both even    (B)  $f$  is odd and  $g$  is even  
 (C)  $f$  is neither even nor odd and  $g$  is even    (D)  $f$  and  $g$  are neither even nor odd
4. Write the expression for the function whose graph is the graph of  $y = x^3$  but shifted down 4 units and left 5 units.  
 (A)  $y = (x-5)^3 - 4$     (B)  $y = (x+5)^3 - 4$     (C)  $y = (x-5)^3 + 4$     (D)  $y = (x-4)^3 - 5$
5. Given  $f(x) = 2x + 3$  and  $g(x) = \sqrt{x}$ , find  $(f \circ g)(x)$ .  
 (A)  $(f \circ g)(x) = \sqrt{2x + 3}$     (B)  $(f \circ g)(x) = (2x + 3)\sqrt{x}$   
 (C)  $(f \circ g)(x) = 2\sqrt{x} + 3$     (D)  $(f \circ g)(x) = 2\sqrt{x + 3}$
6. Find the vertex  $V$  and the  $x$ -intercepts  $x_1$  and  $x_2$  of the quadratic function  $f(x) = 2x^2 - 8x$ .  
 (A)  $V(2, -8); x_1 = 0, x_2 = 4$     (B)  $V(2, -4); x_1 = 0, x_2 = 4$   
 (C)  $V(0, 0); x_1 = -2, x_2 = 4$     (D)  $V(0, 0); x_1 = 2, x_2 = -8$
7. Which of the following functions might have the graph pictured here?  
 (A)  $y = \frac{1}{2}(x^2 - 1)(x - 2)$     (B)  $y = \frac{1}{2}(x^2 + 1)(x - 2)$   
 (C)  $y = (x^2 - 1)\left(1 - \frac{x}{2}\right)$     (D)  $y = -(x - 1)(x - 2)$
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8. Find the vertical and horizontal asymptotes of the function  $f(x) = \frac{2x}{x-5}$ .  
 (A) Vertical:  $x = 5$ ; Horizontal:  $y = 0$     (B) Vertical:  $x = 2$ ; Horizontal:  $y = 1$   
 (C) Vertical:  $x = 2$ ; Horizontal:  $y = 5$     (D) Vertical:  $x = 5$ ; Horizontal:  $y = 2$
9. Find the inverse of the function  $f(x) = \frac{1}{x-2}$ .  
 (A)  $f^{-1}(x) = x - 2$     (B)  $f^{-1}(x) = \frac{1}{x} + 2$     (C)  $f^{-1}(x) = \frac{1}{x+2}$     (D)  $f^{-1}(x) = x + 2$

10. Which of the following is the graph of the function  $f(x) = -3^{-x}$ ?



11. Give the domain  $D$ , range  $R$ , and the  $x$ -intercept  $X$  of the function  $y = \ln x$ .

- (A)  $D = \{x \mid x > 0\}$ ;  $R =$  all real numbers;  $X = 1$   
 (B)  $D =$  all real numbers;  $R = \{y \mid y > 0\}$ ;  $X = 1$   
 (C)  $D = \{x \mid x > 0\}$ ;  $R = \{y \mid y > 0\}$ ;  $X = 1$   
 (D)  $D =$  all real number;  $R =$  all real numbers;  $X = 0$

12. Solve the equation:  $\log_4 x + \log_4 (x - 3) = 1$ .

- (A)  $x = 4$  or  $x = 1$       (B)  $x = 3.5$       (C)  $x = 4$       (D) no solution

13. Iodine 131 is a radioactive material that decays according to the function  $A(t) = A_0 e^{-0.087t}$ , where  $A_0$  is the initial amount present and  $A$  is the amount present at time  $t$  (in years).

Determine how long it takes for 250 grams of iodine 131 to decay to 50 grams.

- (A) 19 years    (B) 5 years    (C) 50 years    (D) 10 years

14. Find the length of the arc of a circle with radius 10 cm subtended by a central angle of  $45^\circ$ .

- (A) 450 cm    (B)  $\frac{40}{\pi}$  cm    (C)  $\frac{\pi}{40}$  cm    (D)  $\frac{5\pi}{2}$  cm

15. Find  $\sin \frac{\pi}{6}$  and  $\tan \frac{\pi}{3}$ : (A)  $\frac{1}{2}, \sqrt{3}$     (B)  $\frac{\sqrt{3}}{2}, \sqrt{3}$     (C)  $\frac{1}{2}, \frac{\sqrt{3}}{3}$     (D)  $\frac{\sqrt{3}}{2}, \frac{\sqrt{3}}{3}$

16. Suppose that  $\cos \theta = 3/5$  and  $\theta$  lies in Quadrant IV. Find  $\sin \theta$  and  $\tan \theta$ .

- (A)  $\sin \theta = 4/5, \tan \theta = -4/3$       (B)  $\sin \theta = -4/5, \tan \theta = -4/3$   
 (C)  $\sin \theta = 4/5, \tan \theta = 4/3$       (D)  $\sin \theta = -4/5, \tan \theta = 4/3$

17. Determine the equation of the sine function which has amplitude 2 and period 4.

- (A)  $y = 2 \sin (4x)$     (B)  $y = 2 \sin \left( \frac{\pi}{2} x \right)$     (C)  $y = 4 \sin (2x)$     (D)  $y = 4 \sin \left( \frac{\pi}{4} x \right)$

18. For what values of  $x$  between 0 and  $2\pi$  does  $y = \sec x$  have vertical asymptotes?

- (A)  $\frac{\pi}{2}, \frac{3\pi}{2}$     (B)  $\frac{\pi}{4}, \frac{3\pi}{4}$     (C)  $0, \pi, 2\pi$     (D) There are no vertical asymptotes.

19. Find the exact value of  $\tan^{-1}(-1)$  and  $\cos^{-1}(-1)$ .  
 (A)  $\frac{3\pi}{4}, \pi$       (B)  $\frac{\pi}{4}, 0$       (C)  $\frac{3\pi}{4}, \frac{3\pi}{2}$       (D)  $\frac{-\pi}{4}, \pi$
20. Which of the following equals  $1 - \frac{\sin^2\theta}{1 - \cos\theta}$ ?  
 (A)  $\cos \theta$       (B)  $-\cos \theta$       (C)  $1 - \sin \theta$       (D)  $1 + \sin \theta$
21. If  $\sin \theta = \frac{1}{3}$  and  $\theta$  lies in Quadrant II, find the exact value of  $\sin\left(\theta + \frac{\pi}{6}\right)$ .  
 (A)  $\frac{5}{6}$       (B)  $\frac{\sqrt{3} + \sqrt{8}}{6}$       (C)  $\frac{\sqrt{3} - \sqrt{8}}{6}$       (D)  $\frac{\sqrt{3} - 1}{2}$
22. If  $\cos \theta = \frac{-3}{5}$  and  $\pi < \theta < \frac{3\pi}{2}$ , then find  $\cos\left(\frac{\theta}{2}\right)$ .  
 (A)  $\frac{-3}{10}$       (B)  $\frac{\sqrt{5}}{5}$       (C)  $\frac{-2\sqrt{5}}{5}$       (D)  $\frac{-\sqrt{5}}{5}$
23. What are the first four positive solutions of the equation  $\sin(2\theta) = \frac{1}{2}$ ?  
 (A)  $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{13\pi}{6}, \frac{17\pi}{6}$       (B)  $\frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}$   
 (C)  $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{7\pi}{3}, \frac{8\pi}{3}$       (D)  $\frac{\pi}{6}, \frac{5\pi}{6}, \frac{7\pi}{6}, \frac{11\pi}{6}$
24. Find all solutions in the interval  $[0, 2\pi]$  for the equation  $2 \cos^2 \theta - 1 = 0$ .  
 (A)  $\frac{\pi}{4}, \frac{7\pi}{4}$       (B)  $\frac{3\pi}{4}, \frac{5\pi}{4}$       (C)  $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$       (D)  $\frac{\pi}{3}, \frac{5\pi}{3}$
25. A ship, off-shore from a vertical cliff known to be 200 feet high, takes a sighting of the top of a cliff. If the angle of elevation is found to be 15 degrees, approximately how far off-shore is the ship?  
 (A) 3000 feet      (B) 1500 feet      (C) 500 feet      (D) 750 feet

**Answers**

- |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|
| 1. D  | 2. A  | 3. C  | 4. B  | 5. C  | 6. A  | 7. C  |
| 8. D  | 9. B  | 10. D | 11. A | 12. C | 13. A | 14. D |
| 15. A | 16. B | 17. B | 18. A | 19. D | 20. B | 21. C |
| 22. D | 23. B | 24. C | 25. D |       |       |       |