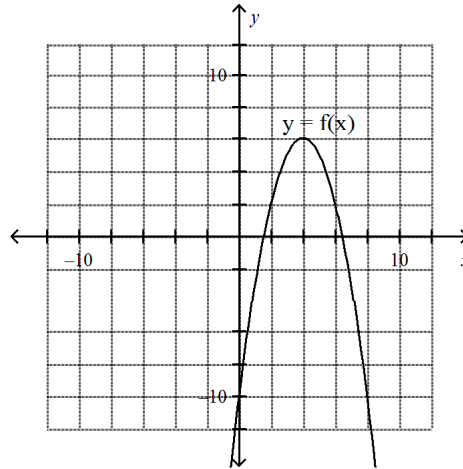
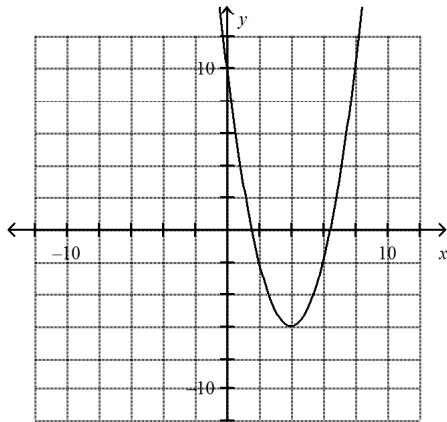
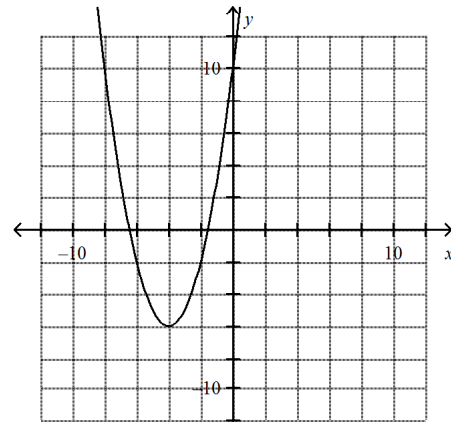
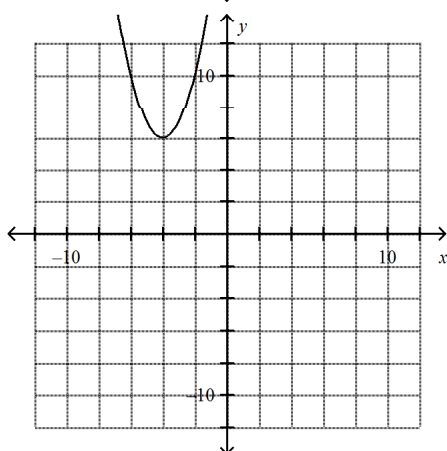
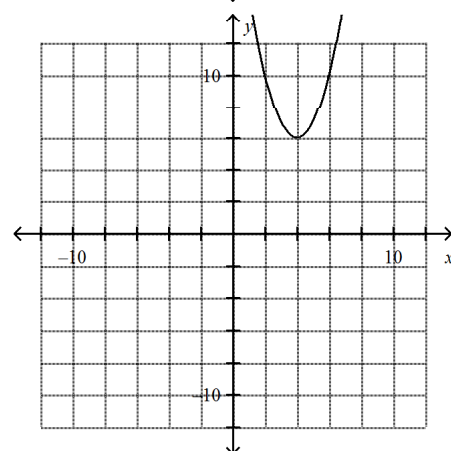


Pre-Calculus 12 Final Exam**Multiple Choice**

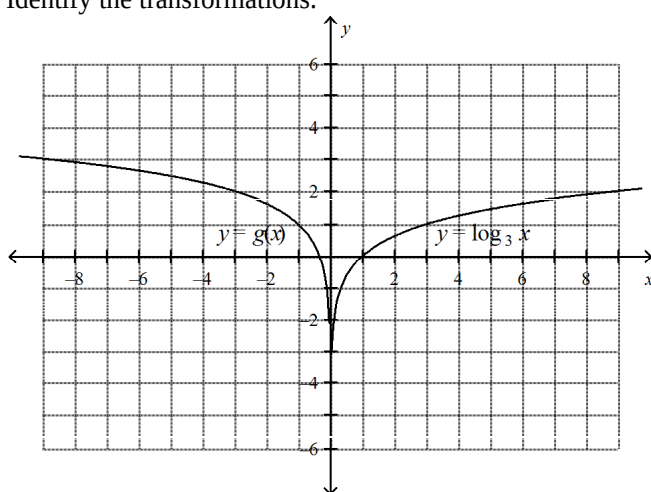
Identify the choice that best completes the statement or answers the question.

- ____ 1. For the graph of $y = f(x)$ shown below, which graph represents $y = -f(-x)$.

**A.****C.****B.****D.**

2. The function $h(x) = g(f(x))$ is the composite of $f(x) = x^2$ and $g(x) = \frac{1}{x-6}$. Which is an explicit equation for $h(x)$, and what are the restrictions on x ?
- A. $h(x) = \frac{1}{x^2 - 6}$
 $x < -\sqrt{6}$ or $x > \sqrt{6}$
- B. $h(x) = \frac{1}{(x-6)^2}$
 $x > 6$
- C. $h(x) = \frac{1}{x^2 - 6}$
 $x \neq -\sqrt{6}$ and $x \neq \sqrt{6}$
- D. $h(x) = \frac{1}{(x-6)^2}$
 $x < 6$
3. Determine the remainder when $2x^3 + 3x^2 - 7x + 8$ is divided by $x + 2$.
- A. 18 B. -2 C. 12 D. -50
4. Use graphing technology to solve: $\sqrt{x-1} - x = -10$
Give the solution to the nearest tenth.
- A. $x \doteq 7.5$ C. $x \doteq 13.9$
B. $x \doteq 7.1$ D. $x \doteq 13.5$
5. The function $y = f(x)$ undergoes two translations; 5 units right, and then 2 units down. What is the new equation for the translated function?
- A. $y + 2 = f(x - 5)$ C. $y + 2 = f(x + 5)$
B. $y - 2 = f(x + 5)$ D. $y - 2 = f(x - 5)$
6. Which statement below describes how the graph of $y + 2 = -3 \left[\frac{3}{2}(x + 3) \right]^3$ is related to the graph of $y = x^3$?
- A. The graph of $y = x^3$ is vertically stretched by a factor of $\frac{3}{2}$, horizontally compressed by a factor of $\frac{1}{3}$, reflected in the x-axis, then translated 3 units left and 2 units down.
- B. The graph of $y = x^3$ is vertically compressed by a factor of $\frac{2}{3}$, horizontally stretched by a factor of 3, reflected in the x-axis, then translated 3 units right and 2 units up.
- C. The graph of $y = x^3$ is horizontally stretched by a factor of $\frac{3}{2}$, vertically stretched by a factor of 3, reflected in the x-axis, then translated 3 units right and 2 units up.
- D. The graph of $y = x^3$ is horizontally compressed by a factor of $\frac{2}{3}$, vertically stretched by a factor of 3, reflected in the x-axis, then translated 3 units left and 2 units down.

- ___ 7. Divide: $(-4x^2 + 22x + 12) \div (x - 6)$
- A. $4x + 6$ B. $4x - 48$ C. $-4x + 12$ D. $-4x - 2$
- ___ 8. Write this logarithmic expression as an exponential expression: $\log_2 0.125 = -3$
- A. $0.125^2 = -3$ C. $0.125 = (-3)^2$
 B. $2 = 0.125^{-3}$ D. $0.125 = 2^{-3}$
- ___ 9. Which of these expressions is NOT equal to $\log 7$?
- A. $\log 70 - \log 10$ C. $\log 42 - \log 6$
 B. $\log 56 - \log 8$ D. $\log 10 - \log 3$
- ___ 10. The graphs of $y = \log_3 x$ and its transformation image $y = g(x)$ are shown. Identify the transformations.

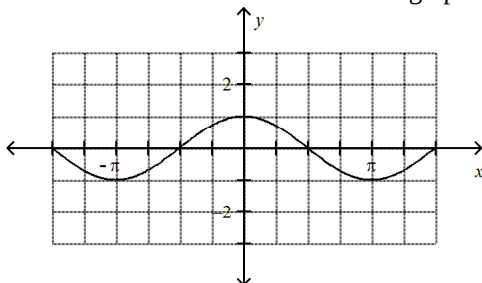


- A. A translation of 2 units left and 1 unit up
 B. A horizontal stretch by a factor of 3 and a reflection in the y -axis
 C. A horizontal compression by a factor of $\frac{1}{3}$ and a reflection in the y -axis
 D. A vertical stretch by a factor of 3 and a reflection in the x -axis
- ___ 11. Suppose the function $y = 11 \cos \frac{2\pi}{7} (x - 3.5) + 15$ models the height, y metres, of a seat on a Ferris wheel at any time x minutes after the wheel begins to rotate. How long does it take the Ferris wheel to complete one full rotation?
- A. 11 min C. 7 min
 B. 15 min D. $\frac{1}{7}$ min

12. In a circle with radius 4 cm, what is the length of the arc that subtends a central angle of $\frac{\pi}{8}$ radians? Give the answer to the nearest tenth.

- A. 1.6 cm C. 0.1 cm
B. 0.4 cm D. 0.5 cm

13. Which function below describes this graph?



- A. $y = \sin x$ C. $y = \sin\left(x + \frac{\pi}{2}\right)$
B. $y = \frac{1}{2} \sin x$ D. $y = \sin\left(\frac{x}{2}\right)$

14. What are the roots of the equation $-\frac{1}{2} = -\frac{2}{5} \csc x$ for $-\pi \leq x \leq \pi$, to the nearest hundredth?

- A. $x \doteq 0.93$ or $x \doteq 2.21$ C. $x \doteq 53.13$
B. $x \doteq -0.64$ or $x \doteq 0.93$ D. $x \doteq 126.87$

15. Write the expression $\sec^2 \theta \cot^2 \theta$ as a single term.

- A. $\csc^2 \theta$ C. $\cos^2 \theta$
B. $\tan^2 \theta$ D. $\sin^2 \theta$

16. Write the expression $\sec \theta (\sin^2 \theta - 1)$ as a single term.

- A. $\cos \theta$ C. $-\cos \theta$
B. $-\cos^2 \theta$ D. $\sec^2 \theta$

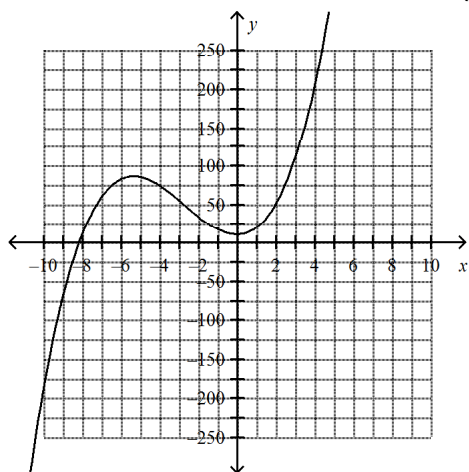
17. The equation of the inverse of $f(x) = -9x$ is

- A. $f^{-1}(x) = \frac{x}{-9}$ C. $f^{-1}(x) = 9x$
B. $f^{-1}(x) = \frac{x}{9}$ D. $f^{-1}(x) = -9x$

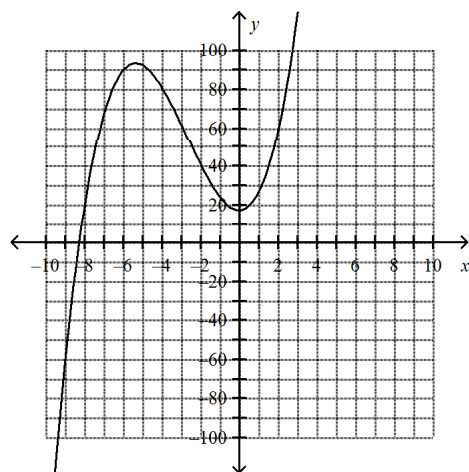
18. Compared to the graph of the base function $f(x) = \sqrt{x}$, the graph of the function $g(x) = \sqrt{x+8} - 4$ is translated
- A. 4 units to the right and 8 units up
 B. 4 units to the left and 8 units down
 C. 8 units to the left and 4 units down
 D. 8 units to the right and 4 units up
19. What is the remainder when $x^4 - 8x^2 + 9x + 8$ is divided by $x + 6$?
- A. 1070
 B. -1070
 C. 962
 D. -962
20. If $-2x^3 - 6x^2 + 5x - 7$ is divided by $x - 7$ to give a quotient of $-2x^2 - 20x - 135$ and a remainder of -952 , then which of the following is true?
- A. $(x - 7)(-2x^2 - 20x - 135) = -952$
 B. $-2x^3 - 6x^2 + 5x - 7 = (x - 7)(-2x^2 - 20x - 135) - 952$
 C. $(x - 7)(-2x^2 - 20x - 135) = 952$
 D. $-2x^3 - 6x^2 + 5x - 7 = (x - 7)(-2x^2 - 20x - 135) + 952$

21. The graph that corresponds to the function $f(x) = x^3 + 8x^2 + 17x + 10$ is

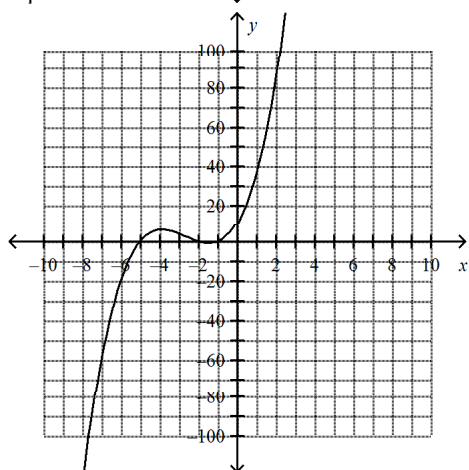
A.



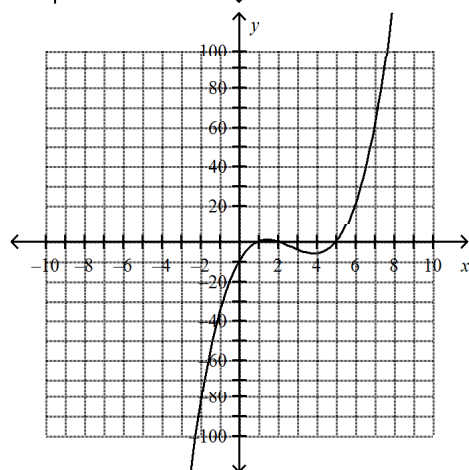
C.



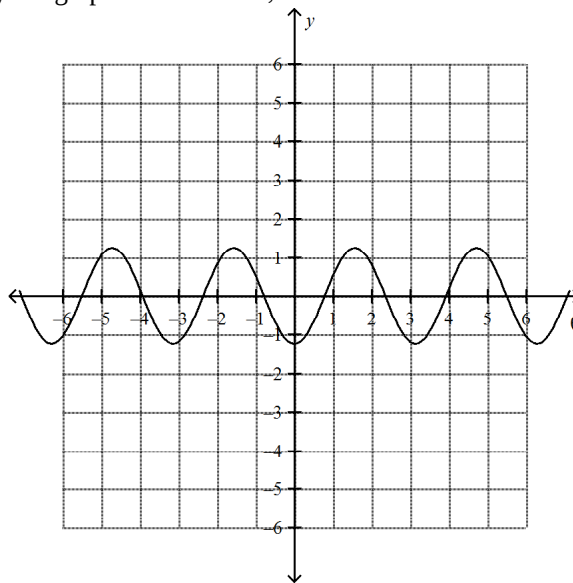
B.



D.



22. Which function has zeros only at $\theta = n\pi, n \in \mathbb{I}$?
- A. $y = \tan(\theta + \frac{2}{3}\pi)$ C. $y = \tan(\theta - \frac{7}{6}\pi)$
 B. $y = \tan(\theta - \pi)$ D. $y = \tan(\theta + \frac{5}{4}\pi)$
23. What is the general solution, in degrees, to the equation $2 \cos x \cos 2x - 2 \sin x \sin 2x = -1$?
- A. $40^\circ + 180n^\circ$ and $80^\circ + 180n^\circ$, where $n \in \mathbb{I}$ C. $40^\circ + 120n^\circ$ and $80^\circ + 120n^\circ$, where $n \in \mathbb{I}$
 B. $40^\circ + 120n^\circ$, where $n \in \mathbb{I}$ D. $220^\circ + 120n^\circ$ and $330^\circ + 120n^\circ$, where $n \in \mathbb{I}$
24. Which function is represented by the graph shown below, where θ is in radians?



- A. $y = -\frac{5}{4}\sin(-2x)$ C. $y = -2\cos(-\frac{5}{4}x)$
 B. $y = -2\sin(-\frac{5}{4}x)$ D. $y = -\frac{5}{4}\cos(-2x)$

For the following question(s), assume that x is in radians, if applicable.

25. Given the functions $f(x) = \sin x$ and $g(x) = \sqrt{2+x}$, what is the value of $g(f(\pi))$?
- A. $\sqrt{\pi}$ C. $\sqrt{2}$
 B. $\sqrt{3}$ D. 1
26. Given the functions $f(x) = x + 3$ and $g(x) = \frac{1}{x-3}$, what is the simplified form of $(f \circ g)(x)$?
- A. $(f \circ g)(x) = \frac{-8}{x}, x \neq 0$ C. $(f \circ g)(x) = \frac{3x-8}{x-3}, x \neq 3$
 B. $(f \circ g)(x) = \frac{3x-8}{x+3}, x \neq -3$ D. $(f \circ g)(x) = \frac{1}{x}, x \neq 0$

27. Find the sum of the arithmetic series $4 + 7 + 10 + 13 + \dots + (3n + 1)$
- A. $\frac{1}{2}(3n^2 + 5n)$ C. $\frac{1}{2}(3n^2 + n)$
 B. $n + 3n^2$ D. $3n - 1$
28. The geometric series $\frac{3}{5}, \frac{-4}{5}, \frac{16}{15}, \frac{-64}{45}, \dots$ written in sigma notation with $k = 1$, is
- A. $\sum_{k=1}^n \frac{4}{3} \left(\frac{-4}{3}\right)^n$ C. $\sum_{k=1}^n \frac{3}{5} \left(\frac{-4}{5}\right)^n$
 B. $\sum_{k=1}^n \frac{-4}{3} \left(\frac{4}{5}\right)^{n-1}$ D. $\sum_{k=1}^n \frac{3}{5} \left(\frac{-4}{3}\right)^{n-1}$
29. Which of the following is the sum of $3 - \frac{3^2}{2} + \frac{3^3}{3} - \frac{3^4}{4} \pm \dots \pm \frac{3^n}{n}$ expressed in correct summation notation with index $k = 1$?
- A. $\sum_{k=1}^n \frac{-3^k}{k}$ C. $-\sum_{k=1}^n \frac{-3^k}{k}$
 B. $\sum_{k=1}^n \frac{(-3)^k}{k}$ D. $-\sum_{k=1}^n \frac{(-3)^k}{k}$
30. The graph of $x^2 + y^2 = 4$ is vertically compressed by a factor of $\frac{1}{5}$, then reflected in the y-axis. Determine an equation for the new graph.
- A. $x^2 + \frac{Y^2}{25} = 4$ C. $-x^2 + 25y^2 = 4$
 B. $x^2 + 25y^2 = 4$ D. $-x^2 + \frac{Y^2}{25} = 4$
31. What is the remainder when $x^{19} - 1$ is divided by $x + 1$?
- A. -20 C. -1
 B. -2 D. 0
32. Identify any holes in the graph of the rational expression $f(x) = \frac{3x^2 + 12x}{x^3 + 2x^2 - 8x}$
- A. $\left(2, \frac{1}{2}\right)$ C. $\left(0, -\frac{3}{2}\right), \left(2, \frac{1}{2}\right)$
 B. $\left(-4, -\frac{1}{2}\right), \left(2, \frac{1}{2}\right)$ D. $\left(-4, -\frac{1}{2}\right), \left(0, -\frac{3}{2}\right)$

33. Solve: $\csc x = 2, 0 \leq x < 2\pi$
- A. $x = \frac{\pi}{6}, \frac{5\pi}{6}$ C. $x = \frac{\pi}{3}, \frac{2\pi}{3}$
 B. $x = \frac{\pi}{6}, \frac{11\pi}{6}$ D. $x = \frac{\pi}{3}, \frac{4\pi}{3}$
34. In relation to $f(x) = \cos \frac{2}{3}x$, what is the phase shift of the function $g(x) = \cos(\frac{2}{3}x - \pi)$?
- A. $-\pi$ C. $-\frac{3}{2}\pi$
 B. π D. $\frac{3}{2}\pi$
35. A Ferris wheel has a radius of 18 metres and a centre C which is 20 m above the ground. It rotates once every 32 seconds. A platform allows a passenger to get on the Ferris wheel 20 m above the ground. If the ride begins by going up, when the time $t = 0$ seconds, determine a sine function that gives the passenger's height, h , in metres, above the ground as a function of t .
- A. $h(t) = 18 \sin \frac{\pi}{16}t + 20$ C. $h(t) = 20 \sin \frac{\pi}{16}t + 18$
 B. $h(t) = 18 \sin \frac{\pi}{32}t + 20$ D. $h(t) = 20 \sin \frac{\pi}{32}t + 18$
36. Solve for x : $\sin x \cos x = \cos x, 0 \leq x < 2\pi$
- A. no solution C. $0, \pi$
 B. $\frac{\pi}{2}$ D. $\frac{\pi}{2}, \frac{3\pi}{2}$
37. What is the smallest positive zero of the function $y = 2 \cos 3x - 1$?
- A. 0.29 C. 0.99
 B. 0.35 D. 1.40
38. Which expression is equivalent to $\cot \theta + \tan \theta$?
- A. $\frac{1}{\sin \theta \cos \theta}$ C. 1
 B. $\frac{\cos \theta + \sin \theta}{\sin \theta \cos \theta}$ D. 2
39. Simplify: $\log_x x^{5x}$
- A. $\frac{5}{x}$ C. $\frac{x}{5}$
 B. 5 D. $5x$
40. Identify any vertical asymptotes in the graph of the rational expression $f(x) = \frac{2x + 10}{x^2 + 3x - 10}$.
- A. $x = -5$ C. $x = -5, x = 2$
 B. $x = 2$ D. $y = 0$

Pre-Calculus 12 Final Exam Answer Section

MULTIPLE CHOICE

- | | |
|------------|------------------|
| 1. ANS: C | DIF: Moderate |
| 2. ANS: C | DIF: Moderate |
| 3. ANS: A | DIF: Easy |
| 4. ANS: D | DIF: Moderate |
| 5. ANS: A | DIF: Moderate |
| 6. ANS: D | DIF: Moderate |
| 7. ANS: D | DIF: Moderate |
| 8. ANS: D | DIF: Easy |
| 9. ANS: D | DIF: Easy |
| 10. ANS: C | DIF: Moderate |
| 11. ANS: C | DIF: Moderate |
| 12. ANS: A | DIF: Easy |
| 13. ANS: C | DIF: Moderate |
| 14. ANS: A | DIF: Moderate |
| 15. ANS: A | DIF: Easy |
| 16. ANS: C | DIF: Easy |
| 17. ANS: A | DIF: Easy |
| 18. ANS: C | DIF: Average |
| 19. ANS: C | DIF: Average |
| 20. ANS: B | DIF: Average |
| 21. ANS: B | DIF: Average |
| 22. ANS: B | DIF: Difficult + |
| 23. ANS: C | DIF: Difficult |
| 24. ANS: D | DIF: Average |
| 25. ANS: C | DIF: Average |
| 26. ANS: C | DIF: Average |
| 27. ANS: A | |
| 28. ANS: D | |
| 29. ANS: D | |
| 30. ANS: B | |
| 31. ANS: B | |
| 32. ANS: D | |
| 33. ANS: A | |
| 34. ANS: D | |
| 35. ANS: A | |
| 36. ANS: D | |
| 37. ANS: B | |

- 38.** ANS: A
- 39.** ANS: D
- 40.** ANS: B