

Algebra II Semester 2 Practice Exam A

1. Find the solution set of $6x^2 - 2x - 2 = 1$.

A. $\left\{\frac{1}{6} + \frac{\sqrt{5}}{6}, \frac{1}{6} - \frac{\sqrt{5}}{6}\right\}$

B. $\left\{\frac{1}{6} + \frac{\sqrt{19}}{6}, \frac{1}{6} - \frac{\sqrt{19}}{6}\right\}$

C. $\left\{\frac{1}{3} + \frac{\sqrt{5}}{3}, \frac{1}{3} - \frac{\sqrt{5}}{3}\right\}$

D. $\left\{\frac{1}{3} + \frac{\sqrt{19}}{3}, \frac{1}{3} - \frac{\sqrt{19}}{3}\right\}$

2. What is the simplified form of the expression $\sqrt[3]{4a^6} + a\sqrt[3]{108a^3}$?

A. $4a^2\sqrt[3]{4}$

B. $2a^2\sqrt[3]{14}$

C. $2a^2 + 3a\sqrt[3]{4}$

D. $2a^3 + 6a^2\sqrt[3]{3a}$

3. Simplify $\frac{1}{b^4} \cdot b^{\frac{1}{4}}$.

A. b

B. $b^{-\frac{15}{4}}$

C. b^{-1}

D. 1

4. Let $f(x) = 2x - 3$ and $g(x) = 2\sqrt{x}$. Which expression is equivalent to $f(x) \cdot g(x)$?

A. $4\sqrt{x} - 3$

B. $2\sqrt{2x - 3}$

C. $2x - 3 + 2\sqrt{x}$

D. $(4x - 6)\sqrt{x}$

5. If $h(x) = 10x^2$ and $j(x) = x + 4$, what is $h(-2) + j(3)$?

A. 47

B. 92

C. 139

D. 407

6. Let $f(x) = 2x^2$ and $g(x) = 4x - 3$. Which expression is equivalent to $(f \circ g)(x)$?

A. $2x^2 + 4x - 3$

B. $8x^3 - 6x^2$

C. $8x^2 - 3$

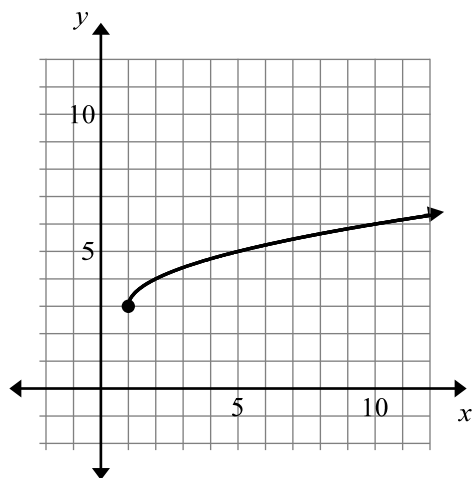
D. $32x^2 - 48x + 18$

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7. Which is the inverse of the function $k(x) = 4x^2 - 16$ for $x \geq 0$?

- A. $k^{-1}(x) = \sqrt{\frac{x}{4} + 4}$
- B. $k^{-1}(x) = \frac{\sqrt{x+4}}{2}$
- C. $k^{-1}(x) = \sqrt{x+4}$
- D. $k^{-1}(x) = \frac{\sqrt{x+16}}{4}$

8. What function is represented by this graph?



- A. $y = \sqrt{x+1} + 3$
- B. $y = \sqrt{x+3} + 1$
- C. $y = \sqrt{x-1} + 3$
- D. $y = \sqrt{x+3} - 1$

9. Solve for x : $\sqrt{5x-3} - 12 = -4$

- A. $x = -25$
- B. $x = \frac{11}{5}$
- C. $x = \frac{31}{5}$
- D. $x = \frac{67}{5}$

10. You are trying to determine the height of a regular truncated pyramid that cannot be measured directly. The height h and slant height s of a truncated pyramid are related by the formula $s = \sqrt{h^2 + \frac{1}{4}(b_2 - b_1)^2}$ where b_1 and b_2 are the lengths of the upper and lower bases of the pyramid, respectively. If $s = 5$, $b_1 = 2$, and $b_2 = 4$, what is the height of the pyramid?

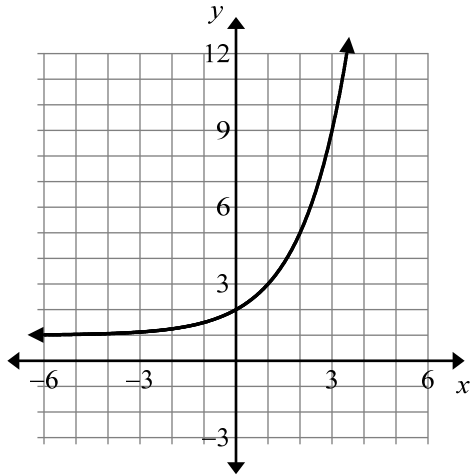
- A. 2
- B. 4
- C. $\sqrt{6}$
- D. $\sqrt{24}$

11. Simplify the expression $[(1-2i) + (1+i)](-3+i)$ where $i = \sqrt{-1}$.

- A. $-7 + 5i$
- B. $-7 - i$
- C. $-5 + 5i$
- D. $5 - 5i$

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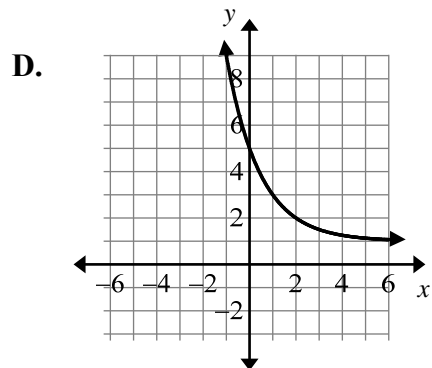
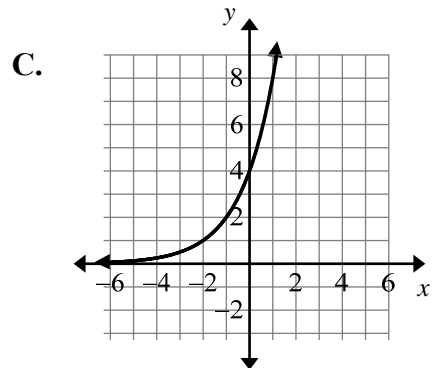
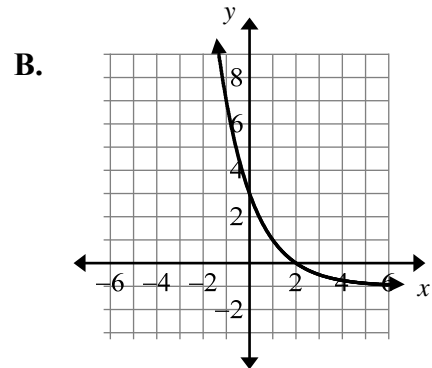
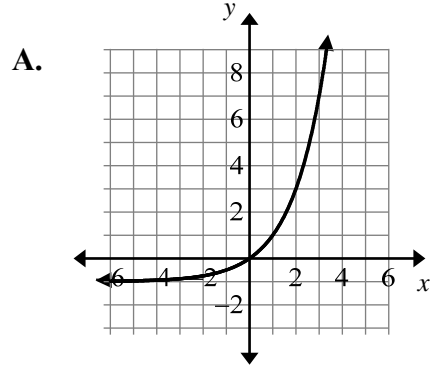
12. What function is represented by the graph?



- A. $y = 1 + 2^x$
- B. $y = 1 + 2x$
- C. $y = 1 + 2x^2$
- D. $y = 1 + 2x^3$

13. Which graph represents

$$f(x) = 4\left(\frac{1}{2}\right)^x - 1?$$



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14. Which expression is equivalent to $\log_3 64$?

- A. $3\log 64$
- B. $64\log 3$
- C. $\frac{\log 3}{\log 64}$
- D. $\frac{\log 64}{\log 3}$

15. Which expression is equivalent to $3\log 4 + \log 6 - \log 8$?

- A. $\log 48$
- B. $\log 1728$
- C. $3\log 2$
- D. $3\log 3$

16. Solve the equation for x : $\ln(2x - 1) = 2$

- A. $x = \frac{2 + e}{2}$
- B. $x = \frac{2^e + 1}{2}$
- C. $x = \frac{2e + 1}{2}$
- D. $x = \frac{e^2 + 1}{2}$

17. Which is a solution for the equation $2^n = 10$?

- A. $n = \log 5$
- B. $n = \log 8$
- C. $n = \frac{10}{\log 2}$
- D. $n = \frac{1}{\log 2}$

18. Solve for x : $2^{x+1} = 8^{x-2}$

- A. $x = \frac{3}{2}$
- B. $x = \frac{7}{2}$
- C. $x = 2$
- D. no solution

19. In the year 1995, about 20 million people used the Internet. Between 1995 and 2001, the number of people who used the internet grew by about 75% each year.

Which function best models the relationship between p , the number of people using the internet (in millions), and t , the number of years since 1995?

- A. $p(t) = 20^{1.75t}$
- B. $p(t) = (0.75)20^t$
- C. $p(t) = 20(1.75)^t$
- D. $p(t) = 20 + 0.75t$

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20. What is the minimum or maximum of the quadratic function

$$q(x) = 8 - x + x^2?$$

A. $q(x) = \frac{35}{4}$

B. $q(x) = \frac{31}{4}$

C. $q(x) = \frac{1}{2}$

D. $q(x) = 8$

21. The value of w varies directly with x and inversely with y . If $w = 5$ when $x = \frac{3}{4}$

and $y = \frac{1}{2}$, what is the value of w when

$x = 4$ and $y = \frac{1}{3}$?

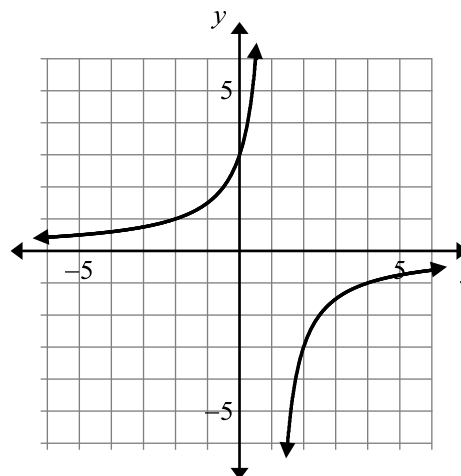
A. 40

B. 90

C. 160

D. $\frac{160}{9}$

22. What function is represented by the graph?



A. $f(x) = -\frac{3}{x}$

B. $f(x) = -\frac{3}{x+1}$

C. $f(x) = -\frac{3}{x-1}$

D. $f(x) = 3 - \frac{3}{x}$

23. Which of the following functions have an asymptote at $y = 1$?

I. $y = \frac{1}{x-1}$

II. $y = \frac{x}{x-1}$

III. $y = \frac{1}{x}$

A. II only

B. I and II only

C. I and III only

D. I, II, and III

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24. Simplify the expression $\frac{x^2 + 2x - 15}{\frac{15}{\frac{x^2 - 9}{30}}}$.

A. $\frac{x-15}{-9}$

B. $\frac{2(x+5)}{x+3}$

C. $\frac{x-9}{15}$

D. $\frac{2(x-3)}{15}$

25. What is the solution set of

$$\frac{3}{x} + \frac{5}{x+2} = 2?$$

A. $\{-1, 3\}$

B. $\{0, 4\}$

C. $\left\{-\frac{1}{2}\right\}$

D. $\{-1\}$

26. What is the solution set of

$$\frac{x+5}{x-2} - \frac{5}{x+2} = \frac{28}{x^2-4}?$$

A. $\{-8, 2\}$

B. $\{-8\}$

C. $\{-4, 2\}$

D. $\{-4\}$

27. The harmonic mean h of a set of n numbers $\{x_1, x_2, x_3, \dots, x_n\}$ is given by the formula

$$\frac{1}{h} = \frac{1}{x_1} + \frac{1}{x_2} + \dots + \frac{1}{x_n}.$$

What is the harmonic mean of two positive numbers that differ by one if the smaller number is k ?

A. $h = \frac{k}{2}$

B. $h = \frac{2k+1}{2}$

C. $h = \frac{k(k+1)}{2k+1}$

D. $h = \frac{2k+1}{k^2+k}$

28. Given the system of linear equations:

$$2x + 3y = 5$$

$$-x + 4y = 6$$

Which expression below shows the solution to the system using matrices?

A. $\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{11} \begin{bmatrix} 4 & -3 \\ 1 & 2 \end{bmatrix} \begin{bmatrix} 5 \\ 6 \end{bmatrix}$

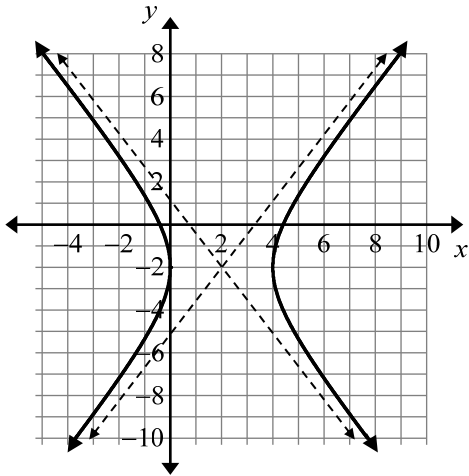
B. $\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{5} \begin{bmatrix} 2 & 3 \\ -1 & 4 \end{bmatrix} \begin{bmatrix} 5 \\ 6 \end{bmatrix}$

C. $\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{11} \begin{bmatrix} -2 & -1 \\ 3 & -4 \end{bmatrix} \begin{bmatrix} 5 \\ 6 \end{bmatrix}$

D. $\begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{5} \begin{bmatrix} -4 & 3 \\ -1 & -2 \end{bmatrix} \begin{bmatrix} 5 \\ 6 \end{bmatrix}$

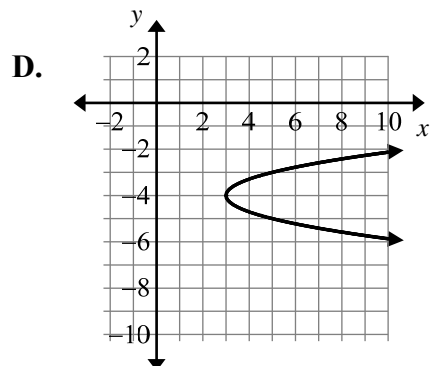
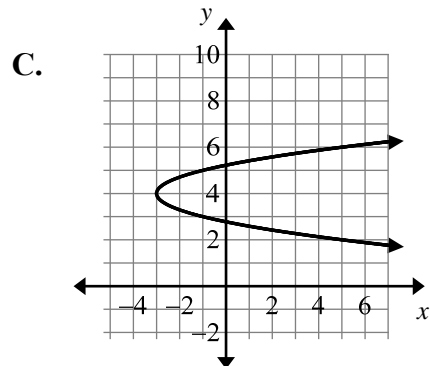
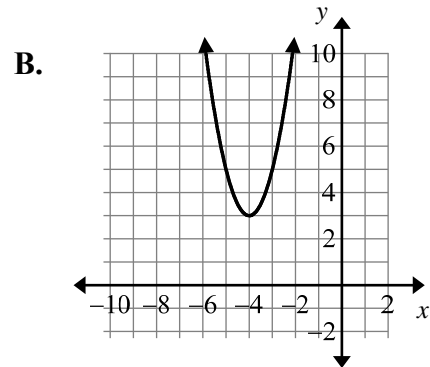
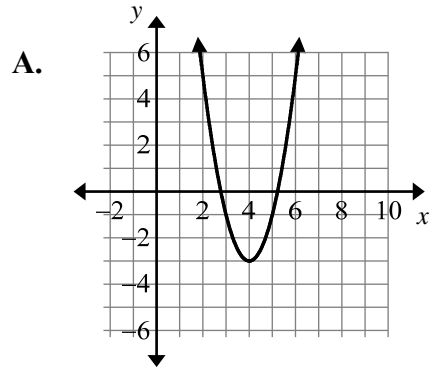
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29. What is the equation of the graph below?



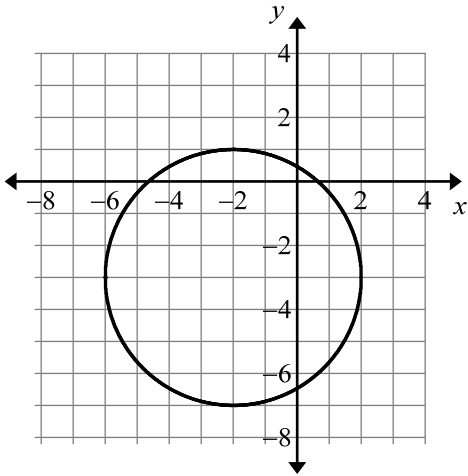
- A. $\frac{(x-2)^2}{4} - \frac{(y+2)^2}{9} = 1$
- B. $\frac{(x+2)^2}{4} - \frac{(y-2)^2}{9} = 1$
- C. $\frac{(y+2)^2}{9} - \frac{(x-2)^2}{4} = 1$
- D. $\frac{(y+2)^2}{4} - \frac{(x-2)^2}{9} = 1$

30. Which graph best represents the equation $x - 3 = 2(y + 4)^2$?



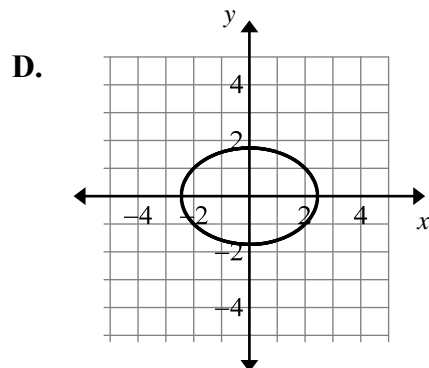
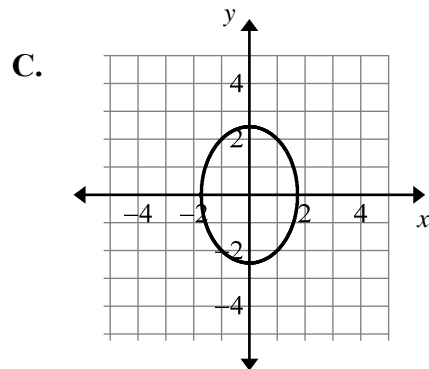
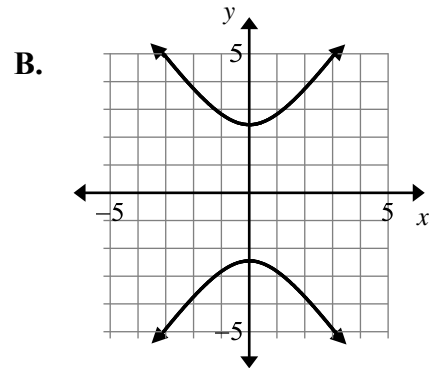
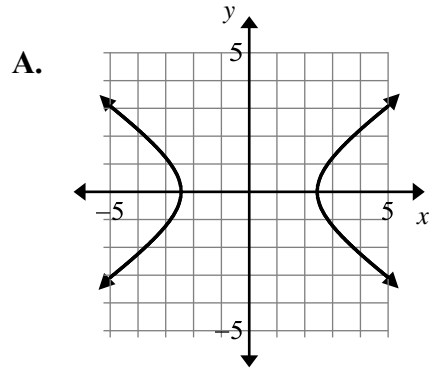
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31. What is the equation for the graph below?



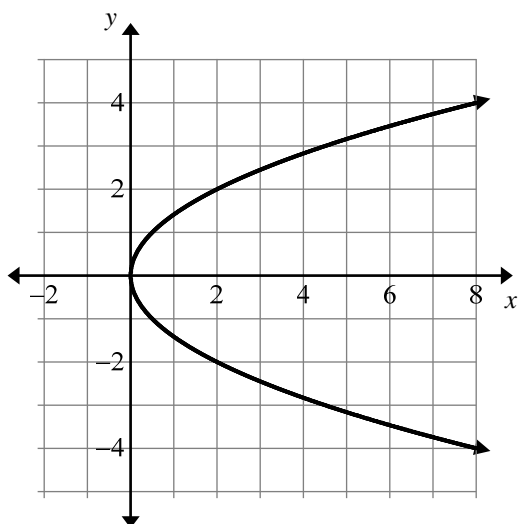
- A. $(x+2)^2 + (y+3)^2 = 4$
- B. $(x-2)^2 + (y-3)^2 = 4$
- C. $(x+2)^2 + (y+3)^2 = 16$
- D. $(x-2)^2 + (y-3)^2 = 16$

32. Which graph best represents the graph of $6y^2 + 3x^2 = 18$?



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33. What equation represents the graph below?

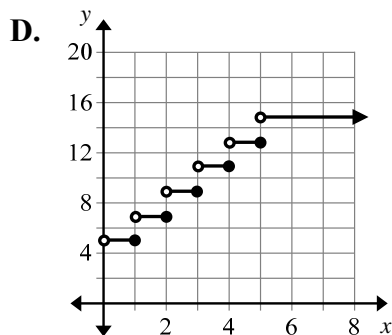
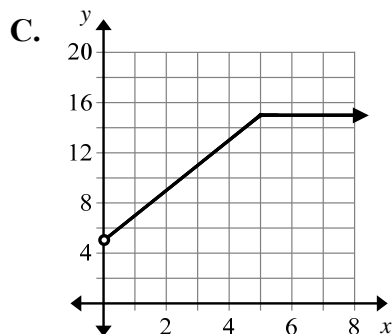
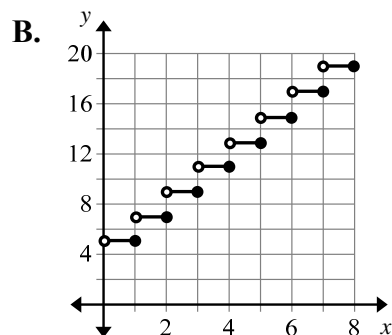
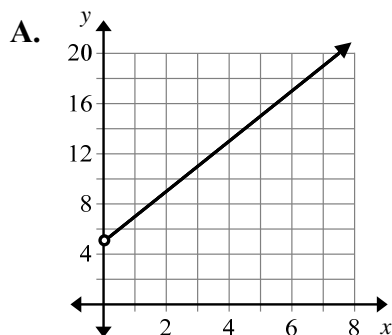


- A. $y = \frac{1}{2}x^2$
 B. $x = \frac{1}{2}y^2$
 C. $y = \sqrt{2x}$
 D. $x = \sqrt{2y}$

34. Which is the equation of a parabola?

- A. $16(x+4)^2 + 4(y+2)^2 = 64$
 B. $y^2 - 16x = 0$
 C. $x^2 + (y-2)^2 = 81$
 D. $\frac{x^2}{25} - \frac{y^2}{25} = 1$

35. The charge for parking at an airport is \$5 for time up to one hour, plus \$2 for each additional hour (or portion of an hour) up to a maximum of \$15. What graph represents this situation?



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36. Expand the expression $\sum_{n=1}^6 -n^2 + 5$.

- A. $-1 - 4 - 9 - 16 - 25 - 36 + 5$
- B. $4 + 1 - 4 - 11 - 20 - 31$
- C. $4 + 3 + 2 + 1 + 0 - 1$
- D. $6 + 9 + 14 + 21 + 30 + 41$

37. What is the series $\frac{4}{7} + \frac{5}{8} + \frac{6}{9} + \frac{7}{10} \dots$ when written in summation notation?

- A. $\sum_{i=4}^{\infty} \frac{i}{i+3}$
- B. $\sum_{i=4}^{\infty} \frac{i+3}{i+6}$
- C. $\sum_{i=4}^{\infty} \frac{4i}{4i-1}$
- D. $\sum_{i=4}^{\infty} \frac{2i-1}{3i-2}$

38. What equation is the sum of the 8 terms in the series $1 + \frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \dots + \frac{1}{2187}$?

- A. $S_8 = \frac{8}{2} \left(1 + \frac{1}{2187} \right)$
- B. $S_8 = \frac{1 - \left(\frac{1}{3} \right)^8}{1 - \frac{1}{3}}$
- C. $S_8 = 1 + \left(\frac{1}{3} \right)^8$
- D. $S_8 = \frac{1}{1 - \frac{1}{3}}$

39. Figure 1 shows a square with an area of 9 square units. In Figure 2, the first square has been divided into nine smaller congruent squares and the middle one removed. In Figure 3, each of the squares is again subdivided and the middle square removed. If the pattern continues, what is the area of Figure 6?



Figure 1

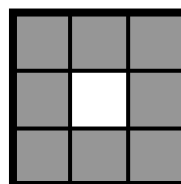


Figure 2

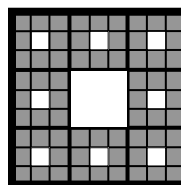


Figure 3

- A. $9 - \left(\frac{1}{9} \right)^5$
- B. $9 - \left(\frac{1}{9} \right)^6$
- C. $9 \cdot \left(1 - \frac{1}{9} \right)^5$
- D. $9 \cdot \left(1 - \frac{1}{9} \right)^6$

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40. What is the sum of the geometric series

$$\sum_{n=1}^{\infty} 3 \left(\frac{3}{4} \right)^{n-1} ?$$

- A. 3
- B. 4
- C. 9
- D. 12

41. Which is a formula of a geometric sequence when $g_1 = 3$ and $g_6 = -96$?

- A. $g_n = -3(1 - (-2)^n)$
- B. $g_n = \frac{3}{1 - (-2)^{n-1}}$
- C. $g_n = -3 \cdot 2^n$
- D. $g_n = 3 \cdot (-2)^{n-1}$

42. Which is a formula of the arithmetic sequence $4, \frac{11}{2}, 7, \frac{19}{2}, \dots$?

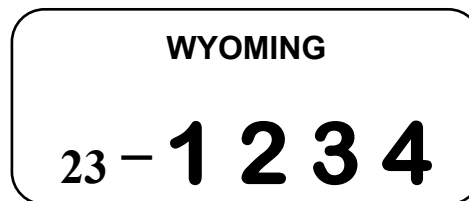
- A. $a_n = \frac{5}{2} + \frac{3}{2}n$
- B. $a_n = 4 + \frac{3}{2}n$
- C. $a_n = 4 \cdot \left(\frac{11}{8} \right)^{n-1}$
- D. $a_n = \frac{n}{2} \left(4 + \frac{19}{2} \right)$

43. Which is a recursive rule for the sequence 2, 4, 7, 11, 16, ...?

- A. $t_1 = 2, t_n = 2t_{n-1}$
- B. $t_1 = 2, t_n = t_{n-1} + 2$
- C. $t_1 = 2, t_n = t_{n-1} + n$
- D. $t_1 = 2, t_n = 3t_{n-1} - n$

44. In the 1980's, the standard configuration for a Wyoming license plate was a small number between 1 and 23, inclusive, followed by four digits with repetition allowed.

For example:



How many license plates were possible for the entire state of Wyoming in the 1980's?

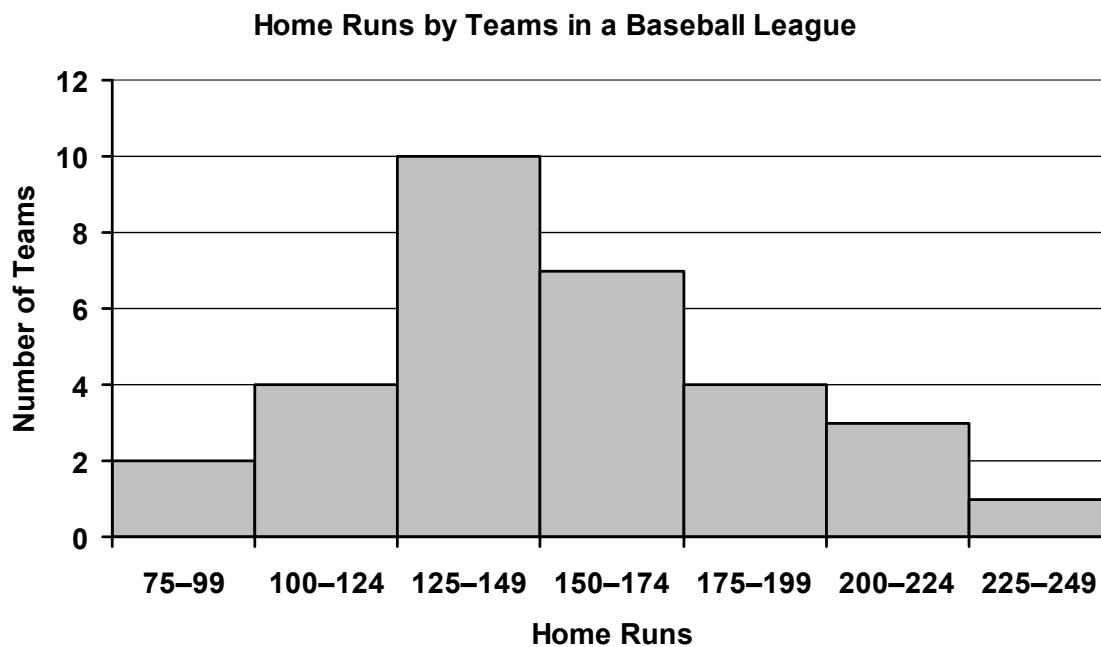
- A. 116,000
- B. 230,000
- C. 300,000
- D. 1,000,000

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45. A student will randomly choose four digits from the set $\{1, 2, 3, 4, 5, 6\}$, without replacement, and arrange them in the order they were chosen. How many different four-digit numbers can be made in this way?
- A. 15
B. 24
C. 360
D. 720
46. Which is a term of the expanded form of $(5 - 2a)^4$?
- A. $1000a$
B. $600a^2$
C. $-40a^3$
D. $-16a^4$
47. What is the coefficient of x^3y in the expansion of $(2x + y)^4$?
- A. 4
B. 8
C. 24
D. 32
48. A cooler contains 8 cans of cola, 6 cans of ginger ale, 4 cans of root beer, and 2 cans of orange soda. If a person reaches in the cooler and pulls out two cans at random, what is the probability that both cans will be ginger ale?
- A. $\frac{1}{10}$
B. $\frac{1}{30}$
C. $\frac{3}{38}$
D. $\frac{3}{40}$
49. Which of these measures are greatly influenced by extreme values?
- I. mean
II. median
III. interquartile range
IV. range
- A. IV only
B. I and IV only
C. II and III only
D. I, III, and IV only

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50. The graph below shows the number of home runs hit by the 31 teams in a baseball league.



Which value could be the median number of home runs?

- A. 177
- B. 162
- C. 147
- D. 112



Algebra II Semester 2 Practice Exam A Free Response

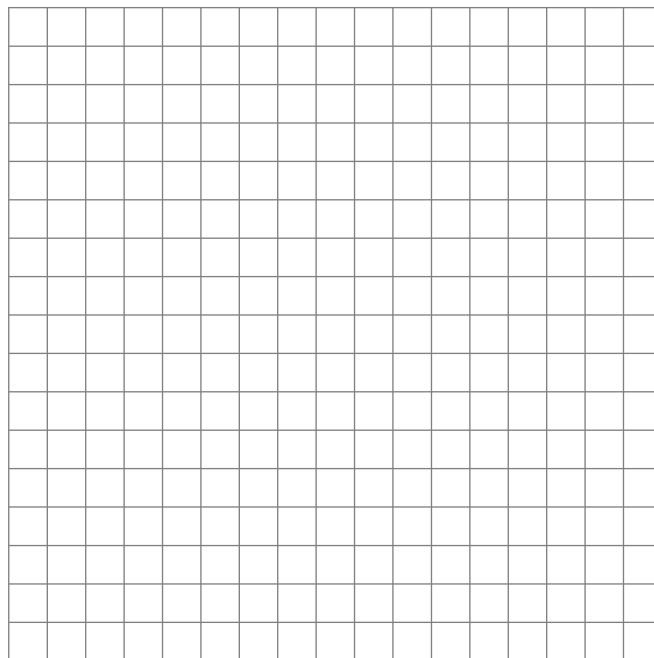
1. Use the functions $p(x) = x^3 - 8$ and $q(x) = \sqrt[3]{x+8}$ to answer the questions below.

A. What are the domain and range of $p(x)$?

B. Sketch the graph of $y = q(x)$ on the grid provided.

C. Are $p(x)$ and $q(x)$ inverse functions of each other? Provide evidence why or why not.

D. Let $r(x) = 2x - 1$. Find $p(r(x))$.



2. The half-life of the radioactive isotope Barium-139 is 83 minutes. A scientist has 20 grams of Barium-139 at time $t = 0$.

A. Write a function that expresses the quantity of Barium-139 as a function of t , the number of minutes after $t = 0$.

The half-life of Sodium-24 is 15 hours. The amount of Sodium-24 after t hours can be expressed as $A(t) \approx A_0 e^{-0.05t}$, where A_0 is the initial amount of the isotope.

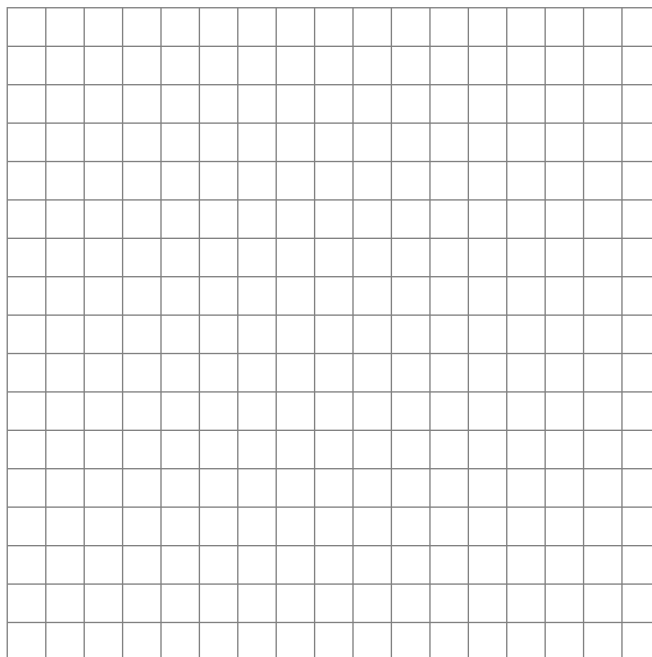
B. If $A_0 = 10$ grams, what amount, in grams, of Sodium-24 would remain after 100 hours? Leave your answer in terms of e .

C. Write an equation for $t(A)$, the time required for 10 grams of Sodium-24 to decay to an amount A .

Algebra II Semester 2 Practice Exam A Free Response

3. Use the function $f(x) = \frac{x^2 - 3x + 2}{2x}$ to answer the questions below.

- A. Sketch the graph of $y = f(x)$ on the grid provided. Be certain to note any asymptotes and intercepts on the graph.



- B. Solve $\frac{15}{x} + \frac{9x-7}{x+2} = 9$.

