College Algebra - Unit I Exam - Practice Questions

Note: The actual exam will consist of 20 multiple choice questions and 6 show-your-work questions. Extra questions are provided for practice.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Simplify the exponential expression. Assume that variables represent nonzero real numbers.

1) \( \frac{(2x^3)^3}{x^{15}} \)

A) \( \frac{2}{x^6} \)  
B) \( \frac{8}{x^9} \)  
C) \( \frac{8}{x^{24}} \)  
D) \( \frac{8}{x^6} \)

Evaluate the expression.

2) \( 81^{-3/2} \)

A) \( -\frac{1}{729} \)  
B) 729  
C) \( -729 \)  
D) \( \frac{1}{729} \)

Simplify the exponential expression. Assume that variables represent nonzero real numbers.

3) \( \left( \frac{6x^{-5}y^{-2}z^{-3}}{2xy^{-2}z^{-3}} \right)^{-3} \)

A) \( \frac{x^{18}}{27z^{18}} \)  
B) \( \frac{x^{18}y^{4}}{27z^{18}} \)  
C) \( \frac{x^{12}}{27z^{18}} \)  
D) \( \frac{3x^{18}}{z^{18}} \)

Solve the problem.

4) The algebraic expression 0.07\(d^{3/2} \) describes the duration of a storm, in hours, whose diameter is \(d \) miles. Use a calculator to determine the duration of a storm with a diameter of 7 miles. Round to the nearest hundredth.

A) 0.19 hours  
B) 18.52 hours  
C) 0.34 hours  
D) 1.30 hours

Solve and check the linear equation.

5) \( 10x + 7 = 2 + 4x \)

A) \( \left\{ \frac{6}{5} \right\} \)  
B) \( \left\{ \frac{5}{6} \right\} \)  
C) \( \left\{ \frac{6}{5} \right\} \)  
D) \( \left\{ \frac{14}{9} \right\} \)

Find the slope of the line that goes through the given points.

6) (-3, -1) and (-4, 5)

A) 6  
B) \( \frac{9}{4} \)  
C) \( \frac{1}{6} \)  
D) \( \frac{4}{9} \)
Solve the inequality. Write the solution set using interval notation and graph it.

7) \(12 - 6x + 7 \geq -7x + 30\)

\[\begin{array}{c}
\text{A) } (-6, \infty) \\
\text{B) } (-\infty, 11] \\
\text{C) } [11, \infty) \\
\text{D) } (-\infty, -6)
\end{array}\]

Solve the problem.

8) ABC phone company charges $23 per month plus 8¢ per minute of phone calls. XYZ phone company charges $11 per month plus 11¢ per minute of phone calls. How many minutes of phone calls in a month make XYZ phone company the better deal?

A) More than 40 minutes  
B) More than 400 minutes 
C) Less than 400 minutes  
D) Less than 40 minutes

Use the given conditions to write an equation for the line in the indicated form.

9) Passing through \((5, 3)\) and perpendicular to the line whose equation is \(y = \frac{1}{2}x + 3\);  
slope-intercept form

A) \(y = -2x - 13\)  
B) \(y = 2x - 13\)  
C) \(y = -\frac{1}{2}x - \frac{13}{2}\)  
D) \(y = -2x + 13\)

Find the slope then describe what it means in terms of the rate of change of the dependent variable per unit change in the independent variable.

10) The linear function \(f(x) = -6.4x + 22\) models the percentage of people, \(f(x)\), who eat at fast food restaurants each week \(x\) years after 1998.

A) \(m = 6.4\); the percentage of people eating at fast food restaurants each week has increased at a rate of 6.4% per year after 1998.  
B) \(m = -6.4\); the percentage of people eating at fast food restaurants each week has decreased at a rate of -6.4% per year after 1998.  
C) \(m = 22\); the percentage of people eating at fast food restaurants each week has increased at a rate of -6.4% per year after 1998.  
D) \(m = -6.4\); the percentage of people eating at fast food restaurants each week has increased at a rate of -6.4% per year after 1998.
Add or subtract as indicated and write the result in standard form.

11) \(3i - (-2 - i)\)

A) 2 - 2i  
B) -2 + 2i  
C) 2 + 4i  
D) -2 - 4i

Divide and express the result in standard form.

12) \(\frac{8 + 9i}{4 - 2i}\)

A) \(\frac{7}{10} + \frac{13}{5}i\)  
B) \(\frac{25}{6} + \frac{13}{6}i\)  
C) 5 - 2i  
D) \(\frac{7}{12} + \frac{13}{6}i\)

Perform the indicated operations and write the result in standard form.

13) \((6 + \sqrt{3})(6 + \sqrt{7})\)

A) 15 - 12\(\sqrt{21}\)i  
B) \((36 + \sqrt{21}) - 57i\)  
C) 57 + 252i  
D) \((36 - \sqrt{21}) + (6\sqrt{7} + 6\sqrt{3})i\)

Perform the indicated operations and write the answer in the form \(a + bi\), where \(a\) and \(b\) are real numbers.

14) \((3 + 9i)(6 - 4i)\)

A) 54 + 42i  
B) -18 + 66i  
C) 54 - 42i  
D) -36i^2 + 42i + 18

Solve the quadratic equations by any method.

15) \(x^2 + 2x - 24 = 0\)

A) \([-6, 1]\)  
B) \([-6, 4]\)  
C) \([6, -4]\)  
D) \([6, 4]\)

16) \((x - 7)^2 = -4\)

A) \([7 \pm 2i]\)  
B) \(\{\pm \frac{2i}{7}\}\)  
C) \([-7 \pm 2i]\)  
D) \([7i \pm 2]\)

Solve the problem.

17) The formula \(P = 0.61x^2 - 0.041x + 3\) models the approximate population \(P\), in thousands, for a species of fish in a local pond, \(x\) years after 1997. During what year will the population reach 24,714 fish?

A) 2002  
B) 2003  
C) 2004  
D) 2005

Solve the equation using the quadratic formula.

18) \(x^2 + 5x + 5 = 0\)

A) \(\left\{\frac{-5 - 3\sqrt{5}}{2}, \frac{-5 + 3\sqrt{5}}{2}\right\}\)  
B) \(\left\{\frac{5 - \sqrt{5}}{2}, \frac{5 + \sqrt{5}}{2}\right\}\)  
C) \(\left\{\frac{-5 - \sqrt{5}}{10}, \frac{-5 + \sqrt{5}}{10}\right\}\)  
D) \(\left\{\frac{5 - \sqrt{5}}{2}, \frac{-5 + \sqrt{5}}{2}\right\}\)

19) \(8x^2 + 1 = 3x\)

A) \(\left\{\frac{3 \pm i\sqrt{23}}{16}\right\}\)  
B) \(\left\{-\frac{3 \pm i\sqrt{23}}{16}\right\}\)  
C) \(\left\{-\frac{3 \pm \sqrt{23}}{16}\right\}\)  
D) \(\left\{\frac{3 \pm \sqrt{23}}{16}\right\}\)
Solve the problem.

20) For a culture of 70,000 bacteria of a certain strain, the number of bacteria $N$ that will survive $x$ hours is modeled by the formula $N = 70000 \sqrt{100 - x}$. After how many hours will 63,000 bacteria survive?

A) 37 hr  
B) 81 hr  
C) 91 hr  
D) 19 hr

21) A balloon is secured to rope that is staked to the ground. A breeze blows the balloon so that the rope is taut while the balloon is directly above a flag pole that is 50 feet from where the rope is staked down. Find the altitude of the balloon if the rope is 90 feet long. Leave your answer in simplified radical form.

A) $4\sqrt{35}$ ft  
B) $2\sqrt{10}$ ft  
C) $20\sqrt{14}$ ft  
D) $10\sqrt{106}$ ft

Use completing the square to find the constant that should be added to the binomial to create a perfect square trinomial.

22) $x^2 - 14x + $  
A) -49  
B) 49  
C) 7  
D) 196

Solve the equation, and check all proposed solutions.

23) $x - \sqrt{3x - 2} = 4$  
A) $[1, 2]$  
B) $[2, 9]$  
C) $[9]$  
D) $[-1]$

Solve the radical equation, and check all proposed solutions.

24) $\sqrt{6x + 55} = x$  
A) $\emptyset$  
B) $\{11\}$  
C) $[11]$  
D) $[-5, 11]$

25) $\sqrt{2x + 10} = x + 6$  
A) $[-4]$  
B) $[8]$  
C) $[2, 8]$  
D) $\left\{-4, \frac{4}{3}\right\}$

26) $\sqrt{x + 6 + \sqrt{2} - x} = 4$  
A) $\{\sqrt{31}, -2\}$  
B) $[-2]$  
C) $[2, -2]$  
D) $[0]$

27) $x^{3/2} = 8$  
A) $\{16\sqrt{2}\}$  
B) $[4]$  
C) $[2]$  
D) $\left\{\sqrt{2}\right\}$

Find the axis of symmetry of the parabola defined by the given quadratic function.

28) $f(x) = 4 - (x + 2)^2$  
A) $x = 4$  
B) $x = 2$  
C) $x = -4$  
D) $x = -2$
Find the domain and range of the quadratic function whose graph is described.

29) The vertex is \((1, 12)\) and the graph opens down.
   A) Domain: \((-\infty, \infty)\)  
      Range: \((-\infty, 12]\)
   B) Domain: \((-\infty, 1]\)  
      Range: \((-\infty, 12]\)
   C) Domain: \((-\infty, 1]\)  
      Range: \((-\infty, 12]\)
   D) Domain: \((-\infty, \infty)\)  
      Range: \([12, \infty)\)

Use the vertex and intercepts to sketch the graph of the quadratic function.

30) \(f(x) = 4 - (x - 2)^2\)

A)  
B)  
C)  
D)
31) \( f(x) = 8 - x^2 - 2x \)
The graph of a quadratic function is given. Determine the function's equation.

32) A) \( g(x) = (x + 1)^2 - 1 \)  
   B) \( h(x) = (x - 1)^2 + 1 \)  
   C) \( f(x) = (x + 1)^2 + 1 \)  
   D) \( j(x) = (x - 1)^2 - 1 \)

Determine whether the given quadratic function has a minimum value or maximum value. Then find the coordinates of the minimum or maximum point.

33) \( f(x) = -2x^2 + 6x \)
   A) minimum; \( \left( \frac{3}{2}, \frac{9}{2} \right) \)  
   B) minimum; \( \left( \frac{3}{2}, \frac{9}{2} \right) \)  
   C) maximum; \( \left( \frac{3}{2}, \frac{9}{2} \right) \)  
   D) maximum; \( \left( \frac{3}{2}, \frac{9}{2} \right) \)

Solve the problem.

34) In one U.S. city, the quadratic function \( f(x) = 0.0042x^2 - 0.46x + 36.44 \) models the median, or average, age, \( y \), at which men were first married \( x \) years after 1900. In which year was this average age at a minimum? (Round to the nearest year.) What was the average age at first marriage for that year? (Round to the nearest tenth.)
   A) 1955, 23.8 years old  
   B) 1953, 36 years old  
   C) 1955, 49 years old  
   D) 1936, 49 years old

Find the distance between the pair of points.

35) (4, 1) and (1, -3)
   A) 10  
   B) 25  
   C) 5  
   D) 6

Find the midpoint of the line segment whose end points are given.

36) (5, 4) and (-2, 5)
   A) \( (7, -1) \)  
   B) \( \left( \frac{3}{2}, \frac{9}{2} \right) \)  
   C) \( \left( \frac{7}{2}, -\frac{1}{2} \right) \)  
   D) \( (3, 9) \)

Write the standard form of the equation of the circle with the given center and radius.

37) Center at (-7, -8); radius of 9
   A) \( (x - 7)^2 + (y - 8)^2 = 9 \)  
   B) \( (x + 7)^2 + (y + 8)^2 = 9 \)  
   C) \( (x + 8)^2 + (y + 7)^2 = 9 \)  
   D) \( (x - 8)^2 + (y - 7)^2 = 9 \)
Complete the square and write the equation in standard form. Then give the center and radius of the circle.

38) \( x^2 + y^2 - 2x - 12y + 37 = 4 \)

- A) \((x - 1)^2 + (y - 6)^2 = 4\)
  \((-1, -6), r = 4\)

- B) \((x - 6)^2 + (y - 1)^2 = 4\)
  \((-6, -1), r = 4\)

- C) \((x - 6)^2 + (y - 1)^2 = 4\)
  \((6, 1), r = 2\)

- D) \((x - 1)^2 + (y - 6)^2 = 4\)
  \((1, 6), r = 2\)

Graph the equation.

39) \((x - 1)^2 + (y - 3)^2 = 36\)

Solve the problem.

40) The equation \( V = -2000t + 24,000 \) describes the value \( V \) in dollars of a certain model of car after it is \( t \) years old. What is the age of the car, if it is currently worth $16,000?

- A) 6 years
- B) 5 years
- C) 3 years
- D) 4 years
The following problems will be graded based on HOW MUCH WORK YOU SHOW. No work = No credit. If you use your calculator to solve these questions, you must write down your preliminary work and sketch any graphs used to answer the question.

Solve for x.

41) \(-4[3x + 7 + 3(x + 1)] = -7x - 5\)

42) \(\frac{x}{6} - 3 = \frac{x}{8} - 1\)

Find an equation for the line with the given properties.

43) The solid line L contains the point (3, 4) and is perpendicular to the dotted line whose equation is \(y = 2x\). Give the equation of line L in slope-intercept form.

![Graph of a line containing the point (3, 4) and perpendicular to a dotted line with equation \(y = 2x\).](image)

44) Find the equation of the line passing through (5, 2) and parallel to the line whose equation is \(6x + y - 6 = 0\). Write your solution in slope-intercept form.

Perform the indicated operation and write the result in standard form.

45) \((8 - 6i)(-5 - 4i)\)

46) \(\frac{10i}{3 + 1}\)

47) \((3 + 4i)(3 - i) - (2 - i)(2 + i)\)

48) Find all real and complex solutions to \(2x^2 + 6x + 3 = 0\)

49) \(x^2 + 5x + 5 = 0\)

50) \(4x^2 + 5x + 7 = 0\)

51) A square sheet of paper measures 45 centimeters on each side. Using the Pythagorean Theorem, determine the length of the diagonal of the square sheet of paper.
52) A car rental agency charges $225 per week plus $0.20 per mile to rent a car. How many miles can you travel in one week for $245?

Graph the following. On your graph clearly label the vertex, x-intercept(s) and y-intercept.

53) \( f(x) = 4 - (x - 2)^2 \)

54) \( f(x) = x^2 + 6x + 8 \)

55) \( f(x) = x^2 - 6x + 5 \)
1) D
2) D
3) A
4) D
5) B
6) A
7) C
8) C
9) D
10) B
11) C
12) A
13) D
14) A
15) B
16) A
17) B
18) D
19) A
20) D
21) C
22) B
23) C
24) C
25) B
26) B
27) B
28) D
29) B
30) D
31) B
32) D
33) D
34) A
35) C
36) B
37) B
38) D
39) B
40) D
41) \[ \frac{35}{17} \]
42) \[ 48 \]
43) \[ y = -\frac{1}{2}x + \frac{11}{2} \]
44) \[ y = -6x + 32 \]
45) \[ -64 - 2i \]
46) \[ 1 + 3i \]
47) \[ 8 + 9i \]
48) \[ \left\{ \frac{-3 - \sqrt{3}}{2}, \frac{-3 + \sqrt{3}}{2} \right\} \]

49) \[ \left\{ \frac{-5 - \sqrt{5}}{2}, \frac{-5 + \sqrt{5}}{2} \right\} \]

50) \[ \left\{ \frac{-5 \pm \sqrt{87}}{8} \right\} \]

51) \(45\sqrt{2}\) cm

52) 100 miles

53)

54)

55)