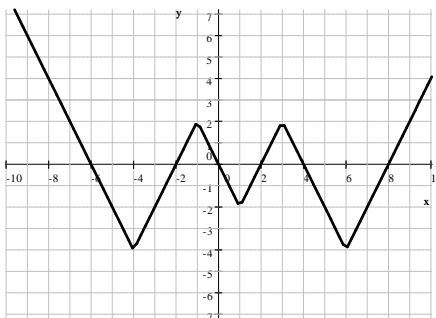


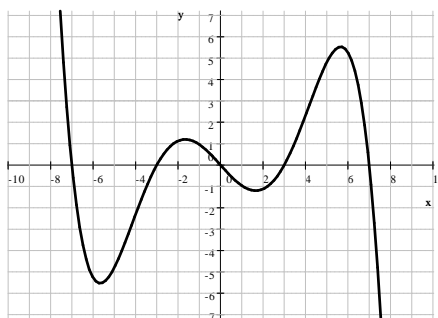
- Re-write $0.30\overline{72}$ as a fraction of integers.
- Simplify each of the following.
 - $(4\sqrt{3} - 2)^2$
 - $\sqrt{20} - 3\sqrt{180} + \sqrt{500}$
 - Rationalize the denominator in $\frac{6}{5 - \sqrt{7}}$
 - Find the exact value of $x^2 - 5x + 8$ if $x = 1 - 2\sqrt{3}$
- Simplify each of the following.
 - $\frac{2a^3(2a^2)^5(-4a)^2}{(-2a^2)(-4a^2)^3}$
 - $\frac{3^{2x-3} \cdot 2^{3x+1}}{6^{2x-1}}$
 - $\frac{3^x \cdot 6^{x+1}}{2^x \cdot 9^{x-1}}$
 - $\frac{2^{2018} + 5 \cdot 2^{2019}}{2^{2020}}$
- Let x denote the number 2^{143} . Simplify the expression $2^{143} + 3 \cdot 2^{144} + 2^{145}$ and write it in terms of x .
- Suppose that $M = 3^{100}$. Write each of the following in terms of M .
 - 3^{101}
 - 9^{100}
 - 3^{99}
 - 3^{50}
- Solve each of the following equations. Make sure to check your solution.
 - $x^3 = 24x^2 + 217x$
 - $\frac{3-x}{4} - \frac{10-3x}{5} = x+2$
 - $(3x-2)(9-x) = 5x - 2(x-3)^2$
 - $3(x-5) - 5(x-1) = -2x+1$
 - $18x^3 = 2x$
- Solve $3x^2 + 5x = 1$ by completing the square.
 - Check your solution(s), using exact values.
- Three sides of a triangle are 10, 15, and x units long.
 - What values are possible for x ?
 - What values are possible for x if it is the length of the shortest side?
 - What values are possible for x if it is the length of the longest side?
- Solve each of the following system of linear equations.
 - $\begin{cases} 3x - 5y = -12 \\ y - x = 4 \end{cases}$
 - $\begin{cases} 2x + 5y = -11 \\ 3x - y = -25 \end{cases}$
 - $\begin{cases} 2x + 3y = -1 \\ y = -\frac{2}{3}x + 2 \end{cases}$
- Completely factor each of the following.
 - $4 - 6x^2 - 2x$
 - $2x^2 - 12x + 20$
 - $16y^4 - 1$
- Factor each of the following by completing the square.
 - $3x^2 - 4x - 319$
 - $3x^2 - 3x + 4$
 - $20x - 2x^2 - 46$
 - $-4x^2 + 3x + 7$
- Find all real numbers x with the following property: x is exactly 6 less than its own reciprocal.
- Graph each of the following equations.
 - $y = -\frac{2}{3}x + 1$
 - $y = x^2 + 4x - 56$
 - $2x - 3y + xy = 6$
- Find the set of all values of x for which $P(x, y)$ is on the graph shown and
 - $y < 0$
 - $y \leq -6$
 - $y \geq 2$



b) Find the set of all values of x for which $P(x, y)$ is on the graph shown and

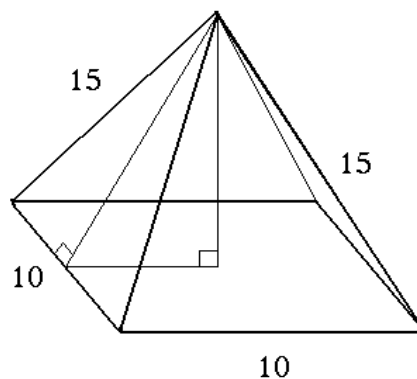
a) $y \geq 0$

b) $y < 0$



15. There is an animal farm where chickens and cows live. All together, there are 53 heads and 174 legs. How many chickens, how many cows?
16. We invested \$10000 into two bank accounts. One account earns 14% per year, the other account earns 8% per year. How much did we invest into each account if the combined interest from the two accounts is \$1238 after the first year?
17. In a hotel, the first night costs 45 dollars, and all additional nights cost 35 dollars. How long did Mr. Williams stay in the hotel if his bill was 325 dollars?
18. What is the smallest value of the expression $x^2 - 20x + 85$?
19. Graph $y = x^2 - 10x + 9$. State the coordinates of at least 5 points, including vertex and intercepts.
20. a) One number is four less than three times another number. Find these numbers if their sum is 64.
b) One number is four less than three times another number. Find these numbers if their product is 160.
21. Find the distance between the points $A(-3, -5)$ and $B(3, 3)$.
22. Compute the exact value of the area of the triangle with sides 6, 6, and 8 units long.
23. a) Find the exact value of the area of a triangle with sides 8 m, 7 m, and 7 m long.
b) Find the exact value of the area of a regular triangle with sides 5 meters long.
24. An arch is in the shape of a semicircle. At a point along the base 1 foot from an end of the arch, the height of the arch is 5 feet. Find the maximum height of the arch. Present exact value of the answer.

25. The picture shows a straight pyramid with a square base. The sides of the base are 10 in long. All other edges are 15 in long.
- a) Find the height of a triangular face.
b) Use part a) to find the height of the pyramid.



Answers

1. $\frac{3042}{9900}$ 2. a) $52 - 16\sqrt{3}$ b) $-6\sqrt{5}$ c) $\frac{\sqrt{7} + 5}{3}$ d) $6\sqrt{3} + 16$
3. a) $8a^7$ b) $\frac{4}{9}2^x$ c) 54 d) $\frac{11}{4}$ 4. $11x$
5. a) $3M$ b) M^2 c) $\frac{M}{3}$ d) \sqrt{M}

6. a) $-7, 0, 31$ b) -5 c) $0, 12$ d) no solution e) $-\frac{1}{3}, 0, \frac{1}{3}$

7. a) $\frac{-5 \pm \sqrt{37}}{6}$ b) if $x = \frac{-5 + \sqrt{37}}{6}$, then

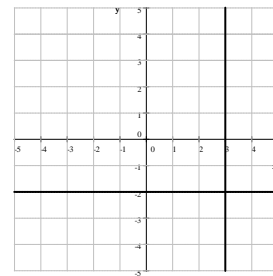
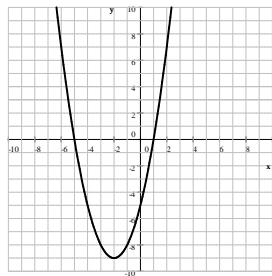
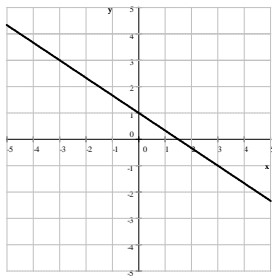
$$\begin{aligned} \text{LHS} &= 3x^2 + 5x = 3 \left(\frac{-5 + \sqrt{37}}{6} \right)^2 + 5 \left(\frac{-5 + \sqrt{37}}{6} \right) = 3 \cdot \frac{25 + 37 - 10\sqrt{37}}{36} + 5 \cdot \frac{-5 + \sqrt{37}}{6} \\ &= \frac{62 - 10\sqrt{37}}{12} + \frac{-25 + 5\sqrt{37}}{6} = \frac{31 - 5\sqrt{37}}{6} + \frac{-25 + 5\sqrt{37}}{6} = \frac{31 - 5\sqrt{37} + 25 + 5\sqrt{37}}{6} = \frac{6}{6} = 1 = \text{RHS} \end{aligned}$$

8. a) $5 < x < 25$ b) $5 < x < 10$ c) $15 < x < 25$ 9. a) $x = -4, y = 0$ b) $x = -8, y = 1$ c) no solution

10. a) $-2(3x - 2)(x + 1)$ b) $2(x^2 - 6x + 10)$ c) $(4y^2 + 1)(2y - 1)(2y + 1)$

11. a) $3 \left(x + \frac{29}{3} \right) (x - 11)$ b) can not be factored c) $-2(x - 5 + \sqrt{2})(x - 5 - \sqrt{2})$ d) $-4(x + 1) \left(x - \frac{7}{4} \right)$

12. $-3 + \sqrt{10}$ and $-3 - \sqrt{10}$ 13. a) $y = -\frac{2}{3}x + 1$ b) $y = x^2 + 4x - 5$ c*) $2x - 3y + xy = 6$



14. a) i) $(-6, -2) \cup (0, 2) \cup (4, 8)$ ii) there is no such x iii) $(-\infty, -7] \cup \{-1, 3\} \cup [9, \infty)$

b) i) $(-\infty, -7] \cup [-3, 0] \cup [3, 7]$ ii) $(-7, -3) \cup (0, 3) \cup (7, \infty)$

15. 19 chickens and 34 cows

16. \$7300 at 14% and \$2700 at 8%

17. 8 nights 18. -15 (when $x = 10$)

19. $y = x^2 - 10x + 9$

$= (x - 5)^2 - 16$

$= (x - 1)(x - 9)$

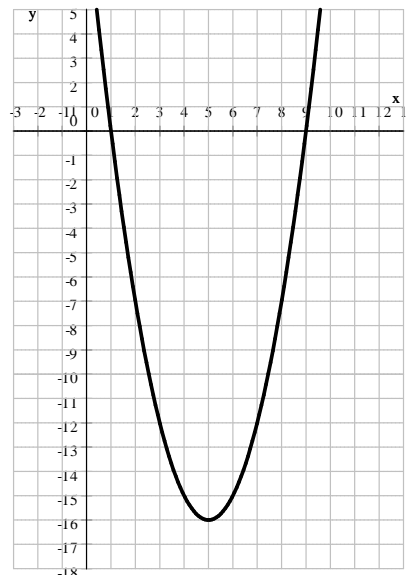
y -intercept: $(0, 9)$

vertex: $(5, -16)$

x -intercepts: $(1, 0)$ and $(9, 0)$

20. a) 17 and 47 b) 8 with 20 and $-\frac{20}{3}$ with -24

21. 10 units 22. $8\sqrt{5}$ 23. a) $4\sqrt{33} \text{ m}^2$ b) $\frac{25}{4}\sqrt{3} \text{ m}^2$



24. 13 ft 25. a) $10\sqrt{2} \text{ in} \approx 14.142136 \text{ in}$ b) $5\sqrt{7} \text{ in} \approx 13.228757 \text{ in}$

References

1. Fractions and Decimals
2. Radical Expressions
3. Rules of Exponents
4. Rules of Exponents
5. Rules of Exponents
6. Linear Equations, Factoring 1
7. Completing the Square Part 4, Radical Expressions
8. Triangle Inequalities
9. Systems of Linear Equations (substitution, elimination)
10. Factoring A, Factoring 1
11. Completing the Square 1, 2, 3, 4
12. Completing the Square 4
13. Graphing Lines
14. Graphical Solutions
15. Systems of Linear Equations (substitution, elimination)
16. Systems of Linear Equations (substitution, elimination)
17. Linear Word Problems
18. Smallest Value of a Quadratic Expression
19. Graphing Parabolas 1
20. a) Linear Word Problems, b) Factoring 1
21. Pythagorean Theorem
22. Pythagorean Theorem
23. Pythagorean Theorem
24. Pythagorean Theorem
25. Pythagorean Theorem

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