

LESSON 179

1. $3|x - 1| + 4 = 7$

$$3|x - 1| = 3$$

$$|x - 1| = 1$$

Isolate the absolute value.

$$x - 1 = 1 \text{ or } x - 1 = -1$$

Rewrite as two equations.

$$x = 2, x = 0$$

Solve each equation.

$$\text{Sum} = 2 + 0 = 2$$

2. Convert $2x - y = 1$ to slope-intercept form and you get $y = 2x - 1$. The slope of the given line is 2.

The slope of the parallel line is also 2 because parallel lines have the same slope.

$$y - y_1 = m(x - x_1)$$

Point-slope form

$$y - 2 = 2(x + 1)$$

Plug in m and $(-1, 2)$.

$$y = 2x + 4$$

Slope-intercept form

$$x\text{-intercept} = a = -2$$

Set $y = 0$ and solve for x .

$$y\text{-intercept} = b = 4$$

Set $x = 0$ and solve for y .

$$a + b = -2 + 4 = 2$$

3. $2x + (x - 5) = 4$

Plug eq1 into eq2.

$$3x - 5 = 4$$

Solve for x .

$$3x = 9$$

$$x = 3$$

$$y = 3 - 5 = -2$$

Plug x into eq1.

$$x + y = 3 + (-2) = 1$$

4. $(x - 2)(x + 3) = 5x - 1$

$$x^2 + x - 6 = 5x - 1$$

Simplify each side.

$$x^2 - 4x - 5 = 0$$

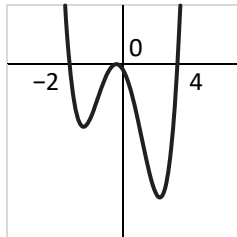
Write in standard form.

$$pq = \text{product of roots} = c/a = (-5)/1 = -5$$

5. The answers are B and C.

Sketch the graph, or test a point in each interval created by the zeros.

The degree is 4 (even) and the leading coefficient is 1 (positive), so both ends of the graph go up.



Zeros: 0 (multiplicity 2)
-2 (multiplicity 1)
4 (multiplicity 1).

The graph crosses the x -axis at $x = -2$ and $x = 4$ and touches the x -axis at $x = 0$.

6.
$$\frac{(5x^2)(2x^3)^2}{(x^3)^4} = \frac{(5x^2)(2^2x^6)}{x^{12}} = \frac{5 \cdot 2^2 \cdot x^8}{x^{12}} = 20x^{-4}$$

$$a/k = 20/(-4) = -5$$

7. $4^{x-1} = 8^x$

$$(2^2)^{x-1} = (2^3)^x$$

Rewrite using base 2.

$$2^{2(x-1)} = 2^{3x}$$

Exponent rules

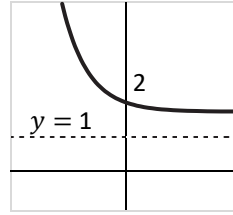
$$2(x - 1) = 3x$$

One-to-one property

$$x = -2$$

Solve for x .

8. The answers are B, C, and E.



Sketch the graph.

1. Graph $y = 2^x$

2. Reflect over the y -axis to get $y = 2^{-x}$.

3. Shift up 1 unit to get $f(x) = 2^{-x} + 1$.

A) The y -intercept is $f(0) = 2^0 + 1 = 2$.

B) The asymptote of $y = 2^x$ at $y = 0$ is shifted up 1 unit to $y = 1$.

D) The graph is in Quadrants I and II.

9. $a = \text{initial population} = 300$

$b = 100\% - 10\% = 90\% = 0.9$ because each year's population is 90% of the previous year's population.

The function is $y = 300(0.9)^t$.

10. $\log_2 1 = 0$

Zero rule

$$\log_2 2 = 1$$

Identity rule

$$\log_2 16 = \log_2 2^4 = 4$$

Use $\log_b b^n = n$.

$$\log_2 1 + \log_2 2 - \log_2 16 = 0 + 1 - 4 = -3$$

11. $\log x + \log(x + 8) = 2 \log 3$

$$\log[x(x + 8)] = \log 3^2$$

Logarithm rules

$$x(x + 8) = 9$$

One-to-one property

$$x^2 + 8x - 9 = 0$$

Standard form

$$(x - 1)(x + 9) = 0$$

Solve for x .

$$x = 1, x = -9$$

$x = -9$ is extraneous, so the solution is $x = 1$.

12. The answer is C.

$f(x)$ is $y = \log_2 x$ reflected over the x -axis.

13. The initial balance is 3,000.

The growth factor is $100\% + 4\% = 104\% = 1.04$.

The function $y = 3000(1.04)^t$ models the balance of the account after t years.

Use the function to find t when $y = 6000$.

$$3000(1.04)^t = 6000$$

$$(1.04)^t = 2$$

$$t = \log_{1.04} 2 = \frac{\ln 2}{\ln 1.04} = 17.67298 \dots$$

It will take about 18 years.

14. $\sqrt[3]{27} + 16^{3/4} = \sqrt[3]{3^3} + (2^4)^{3/4} = 3 + 2^3 = 11$

15. The answer is B.

$$y^{1/3}(y^{1/2})^{2/3} = y^{1/3}y^{1/3} = y^{2/3} = \sqrt[3]{y^2}$$

16. $x + 1 = \sqrt{5 - x}$

$$(x + 1)^2 = 5 - x \quad \text{Square both sides.}$$

$$x^2 + 3x - 4 = 0 \quad \text{Write in standard form.}$$

$$(x - 1)(x + 4) = 0 \quad \text{Solve for } x.$$

$$x = 1, x = -4$$

$x = -4$ is extraneous, so the solution is $x = 1$.

17. $(2x + 1)^{3/2} = 3^3$

$$[(2x + 1)^{3/2}]^{2/3} = (3^3)^{2/3} \quad \text{Raise to the reciprocal power, and solve for } x.$$

$$2x + 1 = 3^2$$

$$x = 4$$

$$x^{1/2} = 4^{1/2} = (2^2)^{1/2} = 2$$

18. The answer is C.

The graph involves a reflection of $y = \sqrt{x}$ over the y -axis, so eliminate A and B.

$(0, 1)$ is on the graph, so choose C.

19. Multiply the numerator and denominator by the LCD of all fractions in the numerator and denominator.

$$\frac{\frac{1}{x+1}}{\frac{2}{x} - \frac{1}{x+1}} = \frac{x(x+1)\left(\frac{1}{x+1}\right)}{x(x+1)\left(\frac{2}{x} - \frac{1}{x+1}\right)}$$

$$= \frac{x}{2(x+1) - x} = \frac{x}{x+2}$$

20. $\frac{x}{x-1} - \frac{4}{x} = \frac{1}{x^2 - x}$

$$\frac{x}{x-1} - \frac{4}{x} = \frac{1}{x(x-1)}$$

Restrictions: $x \neq 0, 1$

LCD = $x(x-1)$

$$x^2 - 4(x-1) = 1$$

Multiply both sides by the LCD, then solve for x .

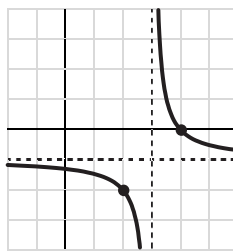
$$x^2 - 4x + 3 = 0$$

$$(x-1)(x-3) = 0$$

$$x = 1, x = 3$$

$x = 1$ is extraneous, so the solution is $x = 3$.

21. The answers are A and D.



Sketch the graph.

1. Graph $y = 1/x$.

2. Shift right 3 units and down 1 unit to get

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

A) The vertical asymptote of $y = 1/x$ at $x = 0$ is shifted right 3 unit to $x = 3$.

B) The horizontal asymptote of $y = 1/x$ at $y = 0$ is shifted down 1 unit to $y = -1$.

C) The graph is not in Quadrant II.

22. x = Liam's time alone

$2x$ = Alex's time alone

Liam's rate + Alex's rate = combined rate, so

$$\frac{1}{x} + \frac{1}{2x} = \frac{1}{8}$$

Solve for x , and you get $x = 12$.

It will take 12 hours.

23. The answer is A.

Convert to standard form by completing the square.

$$x^2 + y^2 - 2x + 4y - 4 = 0$$

$$x^2 + y^2 - 2x + 4y = 4$$

$$x^2 - 2x + y^2 + 4y = 4$$

$$(x^2 - 2x + 1) + (y^2 + 4y + 4) = 4 + 1 + 4$$

$$(x-1)^2 + (y+2)^2 = 9$$

Center: $(1, -2)$, Radius: 3

24. $2x + (x-2)^2 - 3 = 4$

Plug eq1 into eq2.

$$x^2 - 2x - 3 = 0$$

Write in standard form.

$$(x+1)(x-3) = 0$$

Solve for x .

$$x = -1, x = 3$$

$$x > 0, \text{ so } x = 3.$$

$$y = (3-2)^2 - 3 = -2$$

Find y when $x = 3$.

$$x - y = 3 - (-2) = 5$$

25. $(x+2)^2 + (-x+2)^2 = 8$

Plug eq2 into eq1.

$$2x^2 = 0$$

Write in standard form.

$$x = 0$$

Solve for x .

The graphs intersect exactly once.

26. This is an arithmetic sequence with $a_1 = 2$ and $d = 3$.

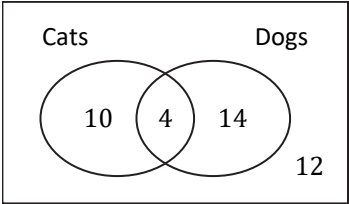
$$a_n = a_1 + (n-1)d = 2 + 3(n-1) = 3n - 1$$

$$a_{15} = 3(15) - 1 = 44$$

27. This is a geometric sequence with $a_1 = 2$ and $r = 3$.

$$S_{10} = a_1 \left(\frac{1-r^{10}}{1-r} \right) = 2 \left(\frac{1-3^{10}}{1-3} \right) = 59048$$

28. Mean = sum divided by count = 5.5
Median = middle value when ordered = 6.5
The positive difference is 1.
29. Estimate = population size · sample proportion
 $15000(240/300) = 12000$
A reasonable estimate is 12,000 voters.

30.  $P(\text{neither})$
 $= 12/40$
 $= 3/10$