LESSON 179

1. $3|x-1|+4=7$
$3|x-1|=3$
$|x-1|=1$ Isolate the absolute value.
$x-1=1$ or $x-1=-1$ Rewrite as two equations.
$x=2, x=0$ Solve each equation.

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-intercept $=a=-2$ Set $y=0$ and solve for x.
y-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.

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

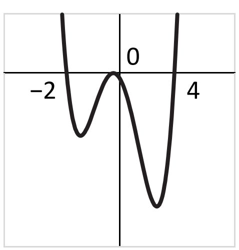
4. $(x-2)(x+3)=5x-1$
$x^2+x-6=5x-1$ Simplify each side.
$x^2-4x-5=0$ Write in standard form.

$pq=$ 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).

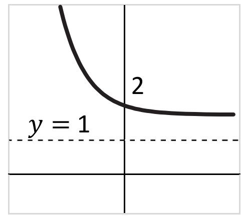
The graph crosses the x-axis at $x=-2$ and $x=4$ and touches the x-axis at $x=0$.

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. $a=$ 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 $y=6000$.
$3000(1.04)^t=6000$
$(1.04)^t=2$

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

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.

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

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

$(x+1)^2 = 5 - x$ — Square both sides.

$x^2 + 3x - 4 = 0$ — Write in standard form.

$(x-1)(x+4) = 0$ — Solve for x.

$x = 1, x = -4$

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

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

$\left[(2x+1)^{3/2}\right]^{2/3} = (3^3)^{2/3}$ — 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. $\dfrac{x}{x-1} - \dfrac{4}{x} = \dfrac{1}{x^2 - x}$

$\dfrac{x}{x-1} - \dfrac{4}{x} = \dfrac{1}{x(x-1)}$ — 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.

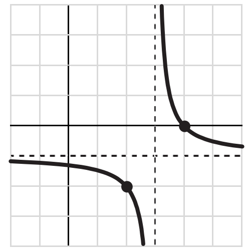
$x^2 - 4x + 3 = 0$

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

$x = 1, x = 3$

$x = 1$ 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.

$x = -1, x = 3$

$x > 0$, 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 $d = 3$.

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

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

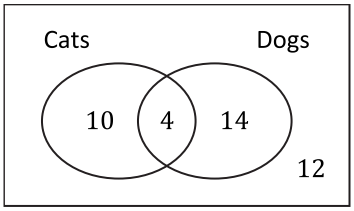
27. This is a geometric sequence with $a_1 = 2$ and $r = 3$.

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

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.



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