LESSON 89

1. $3x + 5 = 2(x - 3) + 7$

$3x + 5 = 2x + 1$	Simplify each side.
$x + 5 = 1$	Subtract $2x$ from both sides.
$x = -4$	Subtract 5 from both sides.

$5 - x = 5 - (-4) = 9$

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

$8x - 5 = kx + 1$	Simplify each side.
$k = 8$	Find k that makes the equation always false.

3. $|2x - 1| - 4 < 1$

$\|2x - 1\| < 5$	Isolate the absolute value.
$-5 < 2x - 1 < 5$	Compound inequality
$-4 < 2x < 6$	Add 1 to all sides.
$-2 < x < 3$	Divide all sides by 2.

The largest integer is 2.

4. Let x be the first even integer. Then the other three even integers are $x + 2$, $x + 4$, and $x + 6$.

Sum = 92, so $x + (x + 2) + (x + 4) + (x + 6) = 92$.
Solve for x, and you get $x = 20$.

The greatest of the integers is $x + 6 = 26$.

5. Slope of line $m = \dfrac{1 - 0}{6 - 2} = \dfrac{1}{4}$

The slope of line n is -4 because perpendicular lines have the slopes that are opposite (negative) reciprocals of each other.

$y - y_1 = m(x - x_1)$	Point-slope form
$y - 7 = -4(x + 1)$	Plug in $m = -4$ and $(-1, 7)$.
$y = -4x + 3$	Slope-intercept form

6. The answer is C.

7.

$x + 4y = 3$	First equation
$6x - 4y = 4$	Second equation × 2
$7x = 7$	Add the equations
$x = 1$	Solve for x.
$x + 4y = 3$	First equation
$1 + 4y = 3$	Plug in $x = 1$.
$y = 1/2$	Solve for y.

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

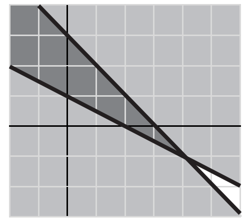
8. The slopes must be equal, so $b = -6$.
The y-intercepts must be equal, so $a = 1$.
$a - b = 1 - (-6) = 7$

9. Let x = number of cupcakes
Let y = number of donuts
A total of 20 cupcakes and donuts, so $x + y = 20$.

Total cost = x cupcakes at \$4 each +
y donuts at \$2 each,
so $4x + 2y = 50$.

Solve the system, and you get $x = 5$ and $y = 15$.

Jose bought 5 cupcakes.

10. 

Quadrant III does not contain any solutions.

11. The answer is C.
The solid line has slope -3, so eliminate B and D.
$(1, 2)$ is a solution, so choose C.

12. *You can use any two variables.*
Let x = number of student tickets
Let y = number of adult tickets
At most 80 people, so $x + y \leq 80$.
Total sales of at least \$500, so $5x + 10y \geq 500$

The system is $x + y \leq 80$ and $5x + 10y \geq 500$.

13. $x(2x - 1)^2 - (x + 3)(x - 3)$
$= x(4x^2 - 4x + 1) - (x^2 - 9)$
$= 4x^3 - 4x^2 + x - x^2 + 9$
$= 4x^3 - 5x^2 + x + 9$

$a + b + c + d = 4 - 5 + 1 + 9 = 9$

14.

$$\begin{array}{r|l} & 3x \;\; - 1 \\ \hline 2x + 3 & 6x^2 + 7x - 8 \\ & 6x^2 + 9x \\ \hline & \quad\;\; -2x - 8 \\ & \quad\;\; -2x - 3 \\ \hline & \qquad\quad -5 \end{array}$$

$3x - 1 + \dfrac{-5}{2x + 3}$

R is the remainder, which is -5.

15. The answers are A and D.
By the Factor and Remainder theorems,
A) $(x - 1)$ is a factor because $p(1) = 0$.
B) $(x + 2)$ is not a factor because $p(-2) = -36 \neq 0$.
C) The remainder is $p(-1) = -6$.
C) The remainder is $p(3) = 14$.

16. $f(-1) = 3(-1) - 1 = -4$
$g(-1) = (-1)^2 + 3(-1) + 4 = 2$
$(f - g)(-1) = f(-1) - g(-1) = -4 - 2 = -6$

17. $y = \frac{1}{2}x + \frac{3}{2}$ Set y equal to $f(x)$.

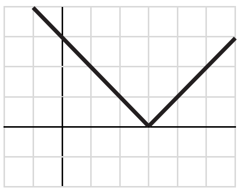
$x = \frac{1}{2}y + \frac{3}{2}$ Switch x and y.

$2x = y + 3$ Multiply both sides by 2.

$y = 2x - 3$ Solve for y.

$f^{-1}(x) = 2x - 3$ Write in function notation.

18. The answers are A, C, and E.



B) The function is neither even nor odd.

C) $\frac{f(3) - f(0)}{3 - 0} = -1$

D) Same as $y = |x|$ shifted right 3 units.

19. $(2 + i)(1 - 2i) + (2i)(3i) - i^3$

$= 2 - 4i + i - 2i^2 + 6i^2 - i^2 \cdot i$

$= 2 - 4i + i - 2(-1) + 6(-1) - (-1)i$

$= 2 - 4i + i + 2 - 6 + i$

$= -2 - 2i$

$ab = (-2)(-2) = 4$

20. $2x^2 - 7x + 3 = 0$

$(2x - 1)(x - 3) = 0$ Factor the quadratic.

$2x - 1 = 0$ or $x - 3 = 0$ Zero-product property

$x = 1/2, x = 3$ Solve for x.

Because $m > n$, $m = 3$ and $n = 1/2$.

$m - 4n = 3 - 4(1/2) = 1$

21. The answer is A.

Sum $= -b/a = -(-4)/1 = 4$

Product $= c/a = 6/1 = 6$

22. The discriminant, $b^2 - 4ac$, must be zero.

$8^2 - 4(k)(2) = 0$ Set discriminant $= 0$.

$64 - 8k = 0$ Solve for k.

$k = 8$

23. $f(x) = a(x - h)^2 + k$ Use vertex form

$f(x) = a(x + 1)^2 - 2$ Plug in vertex $(-1, -2)$.

$-1 = a(0 + 1)^2 - 2$ Plug in point $(0, -1)$.

$-1 = a - 2$ Solve for a.

$a = 1$

$f(x) = (x + 1)^2 - 2$ Vertex form

24. $f(x) = (x + 1)^2 - 1$ Vertex form

$= x^2 + 2x$ Standard form

$= x(x + 2)$ Intercept form

$p = 0, q = -2$

$p + q = 0 + (-2) = -2$

25. $y = x^2$ Parent function

$y = -x^2$ Reflect over the x-axis.

$y = -(x + 2)^2$ Shift left 2 units.

$f(x) = -(x + 2)^2 - 1$ Shift down 1 unit.

$f(x) = -x^2 - 4x - 5$ Standard form

26. $(x - 1)(x - 5) < 0$

The related equation has roots 1 and 5. Use them to create three intervals. Then test a point in each interval to determine the solution set.

$x < 1$	$1 < x < 5$	$x > 5$
$x = 0$ is not a solution.	$x = 2$ is a solution.	$x = 6$ is not a solution.

The solution set is $1 < x < 5$.

The smallest integer in the solutions set is 2.

27. Convert to vertex form by completing the square.

$h(t) = -16t^2 + 32t + 20$

$= -16(x^2 - 2x) + 20$

$= -16(x^2 - 2x + 1 - 1) + 20$

$= -16(x^2 - 2x + 1) + 16 + 20$

$= -16(x - 1)^2 + 36$

The maximum height is 36 feet.

28. $x^3 - x^2 - 2x + 2 = 0$

$x^2(x - 1) - 2(x - 1) = 0$ Factor by grouping.

$(x - 1)(x^2 - 2) = 0$ Factored form

$x - 1 = 0$ or $x^2 - 2 = 0$ Zero-product property

$x = 1, x^2 = 2$ Solve for x.

$x = 1, x = \pm\sqrt{2}$

Sum $= 1 + \sqrt{2} - \sqrt{2} = 1$

29. $(x + 2)(x - \sqrt{3})(x + \sqrt{3}) = 0$ Factored form

$(x + 2)(x^2 - 3) = 0$ Multiply out.

$x^3 + 2x^2 - 3x - 6 = 0$ Standard form

30. The answer is B.

The zeros are -3 and 1, so eliminate C and D.

Zero 1 has an even multiplicity because the graph touches the x-axis at $x = 1$, so choose B.