LESSON 90

1. 3	**2.** A, D	**3.** 3	**4.** 21
5. 4	**6.** B	**7.** -1	**8.** -2
9. 4	**10.** B	**11.** C	**12.** B
13. -1	**14.** 7	**15.** D	**16.** -7
17. 2	**18.** B, C, D	**19.** C	**20.** -2
21. C	**22.** 4	**23.** 0	**24.** -4
25. 6	**26.** $[-1, 3]$	**27.** After 3 seconds	
28. 2	**29.** A	**30.** C	

Worked-out solutions:

1. $3(x-1)+a=4a-x$
$3(x-1)+3=4(3)-x$ Plug in $a=3$.
$3x=12-x$ Simplify each side.
$4x=12$ Add x to both sides.
$x=3$ Divide both sides by 4.

2. A) Subtract 4 from both sides to get $0=4$. There are no solutions because $0=4$ is always false.
D) Subtract 3 from both sides to get $|x-1|=-2$. There are no solutions because an absolute value can never be negative.

3. $-2 \le 7-3x < 1$
$-9 \le -3x < -6$ Subtract 7 from all sides.
$3 \ge x > 2$ Divide both sides by -3 and flip the inequality sign.
$2 < x \le 3$ Write in ascending order.
The largest integer is 3.

4. Let x be the first odd integer. Then the other two odd integers are $x+2$ and $x+4$.
Sum $=57$, so $x+(x+2)+(x+4)=57$.
Solve for x, and you get $x=17$.
The greatest of the integers is $x+4=21$.

5. Convert $x-2y=0$ to slope-intercept form and you get $y=(1/2)x$. The slope of the given line is $1/2$.
The slope of the perpendicular line is -2 because perpendicular lines have the slopes that are opposite (negative) reciprocals of each other.
The y-intercept of the perpendicular line is given as 5.
$y=mx+b$ Slope-intercept form
$y=-2x+5$ Plug in m and b.
$-3=-2k+5$ Plug in $(k,-3)$.
$-8=-2k$ Solve for k.
$k=4$

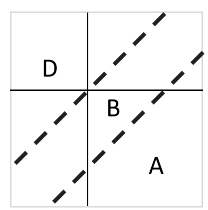
6. The initial amount is 200 and the rate of change is -12, so the equation is $y=200-12x$.

7. $6x+9y=3$ First equation $\times$ 3
$6x+4y=-12$ Second equation $\times$ 2
$5y=15$ Subtract the equations.
$y=3$ Solve for y.
$2x+3y=1$ First equation
$2x+3(3)=1$ Plug in $y=3$.
$2x=-8$ Solve for x.
$x=-4$
$x+y=-4+3=-1$

8. The system will have no solutions if the lines are parallel. $k=-2$ makes the lines have the same slope and thus parallel.

9. Let $x=$ number of adult tickets
Let $y=$ number of child tickets
A total of 10 tickets, so $x+y=10$.
Total cost $=x$ adult tickets at \$8 each $+$ y child tickets at \$5 each,
so $8x+5y=62$.
Solve the system, and you get $x=4$ and $y=6$.
The group bought 4 adult tickets.

10. Test a point in each region. $(2,2)$ satisfies both inequalities.

11.


A) The solution set is region A.
B) The solutions set is region B.
D) The solution set is region D.

12. $2x=$ number of seats from 2-seat tables
$6x=$ number of seats from 6-seat tables
At least 20 tables, so $x+y \ge 20$.
At most 80 seats, so $2x+6y \le 80$.

13. $(x+3)(2x-3)-(x+2)(x-2)$
$=(2x^2-3x+6x-9)-(x^2-4)$
$=2x^2+3x-9-x^2+4$
$=x^2+3x-5$
$a+b+c=1+3+(-5)=-1$

14. Use synthetic division or the Remainder Theorem. By the remainder theorem, the remainder is the value of the dividend polynomial evaluated at $x=2$.
$2^3-2^2+4(2)-5=7$

15. Let $p(x)$ be the given polynomial. By the Factor Theorem, $(x-c)$ is a factor if $p(c)=0$.
A) $(x-1)$ is a factor because $p(1)=0$.
B) $(x-2)$ is a factor because $p(2)=0$.
C) $(x+1)$ is a factor because $p(-1)=0$.
D) $(x+2)$ is not a factor because $p(-2)=36 \ne 0$.

16. $f(2) = 2k + 2$

$g(2) = 2^2 - 3(2) + k = k - 2$

$(f - g)(2) = f(2) - g(2) = -3$

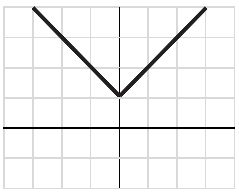
$(2k + 2) - (k - 2) = -3$

$k = -7$

17. Let $x = f^{-1}(5)$, then $f(x) = 5$.

$3x - 1 = 5$

$x = 2$

18. 

A) The range is $[1, \infty)$.

C) $\dfrac{f(2) - f(-2)}{2 - (-2)} = 0$

E) The graph of $y = x^3$ goes up on the right side and down on the left side.

19. A) $x^{16} = (i^2)^8 = (-1)^8 = 1$

B) $(2i)(3i) = 6i^2 = 6(-1) = -6$

C) $i(2 + i) = 2i + i^2 = 2i - 1 = -1 + 2i$

D) $(1 + i)(1 - i) = 1 - i^2 = 1 - (-1) = 2$

20. Use the quadratic formula ($a = 1$, $b = 4$, $c = 5$).

$$x = \frac{-4 \pm \sqrt{-4}}{2} = \frac{-4 \pm 2i}{2} = -2 \pm i$$

$mn = (-2)(1) = -2$

21. Write in standard form, then check the discriminant.

$2x^2 - 7x - 1 = 0$

$b^2 - 4ac = (-7)^2 - 4(2)(-1) = 57 > 0$

A positive discriminant means there are two real roots.

22. Write in standard form, then use the quadratic formula or the sum and product of roots formulas.

$x^2 + 2x - 6 = 0$

Sum of roots $= -b/a = -2/1 = -2$

Product of roots $= c/a = -6/1 = -6$

$m + n - mn = -2 - (-6) = 4$

23.

$f(x) = a(x + 2)(x - 2)$	Use factored form
$1 = a(0 + 2)(0 - 2)$	Plug in $(0, 1)$.
$1 = -4a$	Solve for a.
$a = -1/4$	
$f(x) = -\dfrac{1}{4}(x + 2)(x - 2)$	Plug in a.
$f(x) = -\dfrac{1}{4}x^2 + 1$	Standard form

$abc = (-1/4)(0)(1) = 0$

24. The x-intercepts are -1 and k. The x-coordinate of the vertex is halfway between the two x-intercepts, so $k = 3$.

Plug $(1, 4)$ into $f(x) = a(x + 1)(x - 3)$ and solve for a to get $a = -1$.

$a - k = -1 - 3 = -4$

25.

$y = x^2$	Parent function
$y = 3x^2$	Stretch vertically by 3.
$f(x) = 3(x + 1)^2$	Shift left 1 unit.
$f(x) = 3x^2 + 6x + 3$	

26. $(x + 1)(x - 3) \le 0$

The related equation has roots -1 and 3. Use them to create three intervals. Then test a point in each interval to determine the solution set.

$x \le -1$	$-1 \le x \le 3$	$x \ge 3$
$x = -2$ is not a solution.	$x = 0$ is a solution.	$x = 4$ is not a solution.

The solution set is $-1 \le x \le 3$, or $[-1, 3]$.

27. $-16t^2 + 256 = 112$

$t^2 = 9$

$t = 3, t = -3$

It will reach a height of 112 feet after 3 seconds.

28.

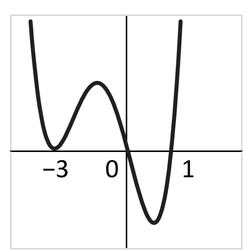
$x^4 - 2x^3 - x^2 + 2x = 0$	
$x(x^3 - 2x^2 - x + 2) = 0$	Factor out the GCF.
$x[x^2(x - 2) - (x - 2)] = 0$	Factor by grouping.
$x(x - 2)(x^2 - 1) = 0$	
$x(x - 2)(x + 1)(x - 1) = 0$	Difference of squares
$x = 0, x = 2, x = -1, x = 1$	
Sum $= 0 + 2 + (-1) + 1 = 2$	

29.

$(x - 1)(x - 2i)(x + 2i) = 0$	Factored form
$(x - 1)(x^2 + 4) = 0$	Multiply out.
$x^3 - x^2 + 4x - 4 = 0$	Standard form

30. 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 1)
1 (multiplicity 1)
-3 (multiplicity 2)

The graph crosses the x-axis at $x = 0$ and $x = 1$ and touches the x-axis at $x = -3$.