1. Answer the following questions about the function: $f(x) = -2x^2 - 12x + 3$

(1 point) a. What is the name of the graph of this function? *parabola*

(1 point) b. What is the orientation (direction of opening) of the graph of this function? *downwards*

(1 point) c. Does this function have a minimum or maximum value (select one)? *max*

(1 point) d. What is the y-intercept of this function? *3 or (0,3)*

(2 points) e. What is the equation of the axis of symmetry of this function? *x = -3*

$$x = \frac{12}{2(-2)}$$
$$x = \frac{12}{-4}$$
$$x = -3$$

(3 points) f. What are the coordinates of the vertex of this function? *(-3, 21)*

$f(-3) = -2(-3)^2 - 12(-3) + 3$ $f(-3) = 21$
$f(-3) = -2(9) + 36 + 3$
$f(-3) = -18 + 36 + 3$

(1 point) g. What is the minimum or maximum value of this function? *21*

 / 10

2. Graph the equation $y = x^2 - 4x + 4$. Be sure to include the vertex, intercepts, and at least two other specific points. (You don't have to use the whole t-table, but may find it helpful to do so.)
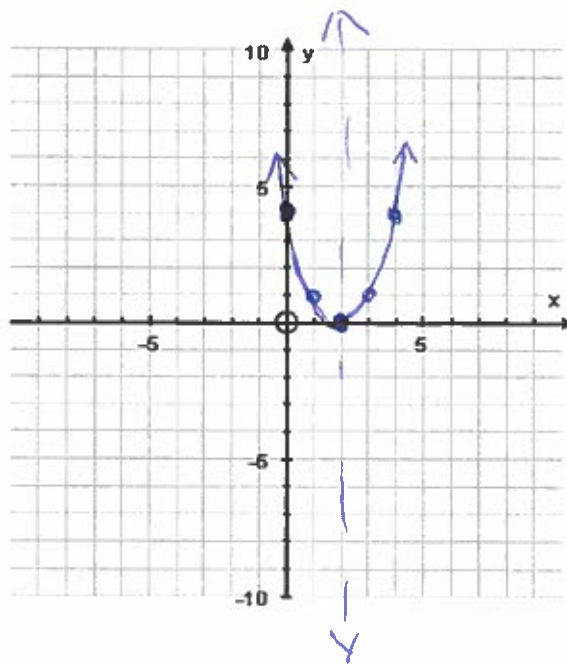
 (7 points)

x	y	(x, y)
2	0	(2,0)
1	1	(1,1)
0	4	(0,4)
-1	10	(-1,10)

$x = \frac{4}{2}$ $4 - 8 + 4$

$x = 2$

$1 - 4 + 4$

(1 point) a. How many solutions / zeros / roots does it have? *one*

(2 points) b. Estimate the solution(s) / zero(s) / root(s) *(2,0) or x = 2*

 / 10

Factor. (4 points each)

3. $6b^2 - 5b - 4$

$$6b^2 - 8b + 3b - 4$$
$$2b(3b-4) + 1(3b-4)$$
$$\boxed{(3b-4)(2b+1)}$$

(x)	$(+)$
-24	-5
$-8(3)$	$-8+3$

4. $75y^2 + 12$

$$\boxed{3(25y^2 + 4)}$$

GCF!

/8

Solve. (4 points each)

5. $4x^2 - 36x + 72 = 0$

$$4(x^2 - 9x + 18)$$
$$4(x-3)(x-6) = 0$$
$$x-3=0 \qquad x-6=0$$
$$x=3 \qquad\quad x=6$$
$$\boxed{\{3,6\}}$$

60
$2 \cdot 30$
$2 \cdot 15$
$3 \cdot 5$

6. $4a^2 + 26a = 3a - 15$

$$4a^2 + 23a + 15 = 0$$
$$4a^2 + 20a + 3a + 15 = 0$$
$$4a(a+5) + 3(a+5) = 0$$
$$(a+5)(4a+3) = 0$$
$$a+5=0 \qquad 4a+3=0$$
$$a=-5 \qquad\quad 4a=-3$$
$$\qquad\qquad a=-3/4$$
$$\boxed{\{-5, -3/4\}}$$

(x)	$(+)$
60	23
$20(3)$	$20+3$

/8

Bonus: Special Products (+2 points each)

7. $5x^2 + x - 100 = 350 + x - 3x^2$

$$8x^2 - 450 = 0$$
$$2(4x^2 - 225) = 0$$
$$2(2x-15)(2x+15) = 0$$
$$2x-15=0 \qquad 2x+15=0$$
$$2x=15 \qquad\quad 2x=-15$$
$$x=15/2 \qquad\quad x=15/2$$
$$\boxed{\{\pm 15/2\}}$$

8. $93x^2 - 42x + 30x^3 + 15 = 15$

$$30x^3 + 93x^2 - 42x = 0$$
$$3x(10x^2 + 31x - 14) = 0$$
$$3x(10x^2 + 35x - 4x - 14) = 0$$
$$3x[5x(2x+7) - 2(2x+7)] = 0$$
$$3x(2x+7)(5x-2) = 0$$
$$3x=0 \quad 2x+7=0 \quad 5x-2=0$$
$$x=0 \qquad 2x=-7 \qquad 5x=2$$
$$\qquad\quad x=-7/2 \qquad x=2/5$$

(x)	$(+)$
-140	31
$35(-4)$	$35-4$

140
$14 \cdot 10$
$7 \cdot 2 \cdot 2 \cdot 5$

$$\boxed{\{-7/2, 0, 2/5\}}$$

1. Answer the following questions about the function: $f(x) = -3x^2 - 12x + 2$

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(1 point) b. What is the orientation (direction of opening) of the graph of this function? downwards

(1 point) c. Does this function have a minimum or maximum value (select one)? max

(1 point) d. What is the y-intercept of this function? 2 or (0,2)

(2 points) e. What is the equation of the axis of symmetry of this function? $x = -2$

$x = \dfrac{12}{2(-3)}$

$x = \dfrac{12}{-6}$

$x = -2$

(3 points) f. What are the coordinates of the vertex of this function? (-2, 14)

$f(-2) = -3(-2)^2 - 12(-2) + 2$

$f(-2) = -3(4) + 24 + 2$
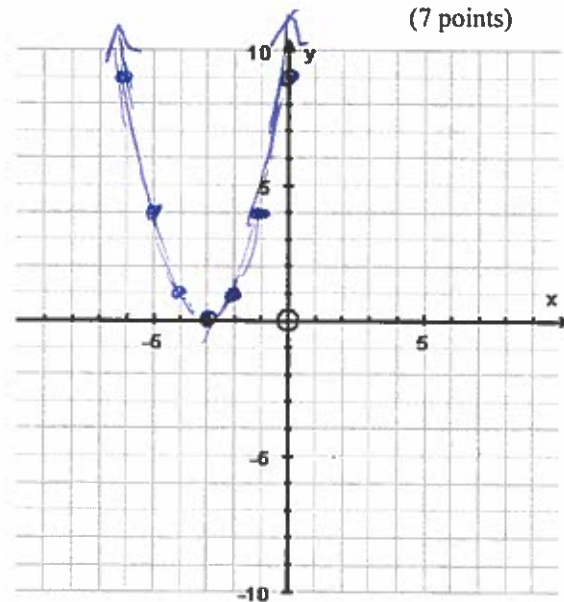
$f(-2) = -12 + 24 + 2$

$f(-2) = 14$

(1 point) g. What is the minimum or maximum value of this function? 14.

/ 10

2. Graph the equation $y = x^2 + 6x + 9$. Be sure to include the vertex, intercepts, and at least two other specific points.
(You don't have to use the whole t-table, but may find it helpful to do so.)

x	y	(x, y)
-3	0	(-3,0)
-1	4	(-1,4)
-2	1	(-2,1)
0	10	(0,10)

$x = \dfrac{-6}{2}$

$x = -3$

$4 = 12 + 9$

$13 - 12$

$9 - 18 + 9$

$1 - 6 + 9.$

(7 points)

(1 point) a. How many solutions / zeros / roots does it have? one

(2 points) b. Estimate the solution(s) / zero(s) / root(s) (-3,0) or x = -3

/ 10

Factor. (4 points each)

3. $64y^2 + 36$

$$\boxed{4\left(16y^2 + 9\right)}$$

GCF!

4. $6b^2 - 7b - 5$

$(x) \mid (+)$
$-30 \mid -7$
$-10(3) \mid -10 + (-3)$

$6b^2 - 10b + 3b - 5$

$2b(3b-5) + 1(3b-5)$

$$\boxed{(3b-5)(2b+1)}$$

/ 8

Solve. (4 points each)

5. $3x^2 - 24x + 36 = 0$

$3(x^2 - 8x + 12) = 0$

$3(x - 2)(x - 6) = 0$

$x - 2 = 0 \qquad x - 6 = 0$
$x = 2 \qquad\quad x = 6$

$$\boxed{\{2, 6\}}$$

105
∧
$5 \cdot 21$
∧
$7 \cdot 3$

6. $5a^2 + 40a = 2a - 21$

$(x) \mid (+)$
$105 \mid 38$
$35(3) \mid 35 + 3$

$5a^2 + 38a + 21 = 0$
$5a^2 + 35a + 3a + 21 = 0$
$5a(a + 7) + 3(a + 7) = 0$
$(a + 7)(5a + 3) = 0$

$a + 7 = 0 \qquad 5a + 3 = 0$
$a = -7 \qquad\quad 5a = -3$
$\qquad\qquad\qquad a = -3/5$

$$\boxed{\{-7, -3/5\}}$$

/ 8

Bonus: Special Products (+2 points each)

7. $5x^2 + x - 100 = 350 + x - 3x^2$

$8x^2 - 450 = 0$
$2(4x^2 - 225) = 0$
$2(2x - 15)(2x + 15) = 0$

$2x - 15 = 0 \qquad 2x + 15 = 0$
$2x = 15 \qquad\quad 2x = -15$
$x = 15/2 \qquad\quad x = -15/2$

$$\boxed{\{\pm 15/2\}}$$

8. $93x^2 - 42x + 30x^3 + 15 = 15$

$(x) \mid (+)$
$-140 \mid 31$
$+35(4) \mid 35 -$

$30x^3 + 93x^2 - 42x = 0$
$3x[10x^2 + 31x - 14] = 0$
$3x[10x^2 + 35x - 4x - 14] = 0$
$3x[5x(2x + 7) - 2(2x + 7)] = 0$
$3x(2x + 7)(5x - 2) = 0$

$3x = 0 \qquad 2x + 7 = 0 \qquad 5x - 2 = 0$
$x = 0 \qquad\quad 2x = -7 \qquad\quad 5x = 2$
$\qquad\qquad\quad x = -7/2 \qquad\quad x = 2/5$

$$\boxed{\{-7/2, 0, 2/5\}}$$