① What is the x-coordinate of the intersection of the two lines?

$$\begin{cases} y = 7x - 3 \\ 4x + y = 12 \end{cases}$$

$$4x + (7x - 3) = 12$$
$$4x + 7x - 3 = 12$$
$$11x - 3 = 12$$
$$ +3 \quad +3$$
$$\frac{11x}{11} = \frac{15}{11}$$

$$\boxed{x = \frac{15}{11}}$$

② What is the product of the binomials?

$$(6x + 9)(2x - 7) \qquad * FOIL$$

$$12x^2 - 42x + 18x - 63$$
$$\boxed{12x^2 - 24x - 63}$$

③ $\begin{cases} 4x + 5y = p \\ -x + 8y = q \end{cases}$ if $(3, 2)$ is a solution, find $p + q$.

(x, y)

$$4(3) + 5z = p$$
$$\boxed{12 + 5z = p}$$
$$-(3) + 8z = q$$
$$\boxed{-3 + 8z = q}$$

$$\overset{p + q}{(12 + 5z) + (-3 + 8z)}$$
$$12 + 5z - 3 + 8z$$
$$\boxed{13z + 9}$$

④ What is equivalent to $\sqrt[2]{r^8 s^{15}}$?

$$\boxed{r^4 s^7 \sqrt{s}}$$

⑤ Let $f(x) = 4x^2 + 2x - 8$ and $g(x) = -8x + 2$. What is $f(x) - g(x)$?

$$4x^2 + 2x - 8 - 1(-8x + 2)$$
$$4x^2 + 2x - 8 + 8x - 2$$
$$\boxed{4x^2 + 10x - 10}$$

⑥ What number should be added to complete the square?
$$x^2 - 18x = 16$$
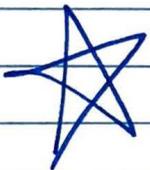
$$\left(\frac{b}{2}\right)^2 = \left(\frac{-18}{2}\right)^2 = (-9)^2 = \boxed{81}$$

⑦ What are the coordinates of the vertex?
a) $f(x) = 5(x-2)^2 + 7$ (h,k) $(2, 7)$
b) $g(x) = 2(x-4)^2 - 1$ $(4, -1)$
c) $h(x) = 4(x-7)^2 + 16$ $(7, 16)$

⑧ Graph $y < 3x + 2$
$$y \geq -x - 1$$
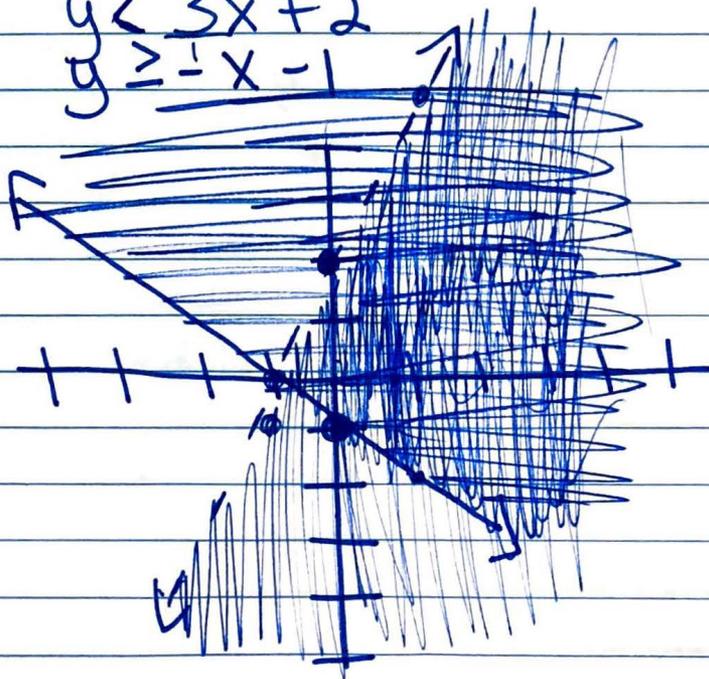
⑨ Is 4 a common factor of
$36x^2 + 16x$?

$9 \cdot \boxed{4}$ $4 \cdot \boxed{4}$ $\boxed{\text{YES}}$

⑩ Is 4x a common factor
of $36x^2 + 16x$?

$9 \cdot \boxed{4} \cdot x \cdot x$ $4 \cdot \boxed{4} \cdot x$ $\boxed{\text{YES}}$

⑪ Is $2x^2$ a common factor of
$36x^2 + 16x$?

$\boxed{2} \cdot 18 \cdot \boxed{x \cdot x}$ $\boxed{2} \cdot 8 \cdot \boxed{x}$ $\boxed{\text{NO}}$
$2x^2 \checkmark$ ✗ NO

⑫ Graph $y = -2x^2 - 8x$.
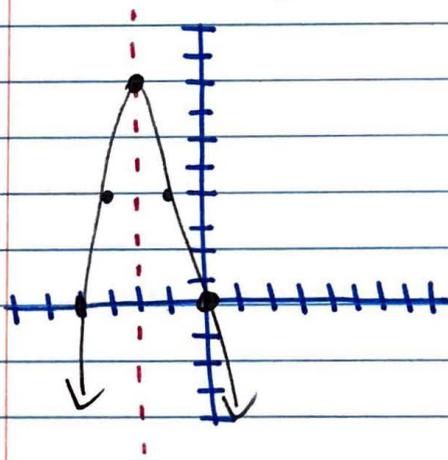
$x = \dfrac{-b}{2a} = \dfrac{-(-8)}{2(-2)} = \dfrac{8}{-4} = -2$

$(-2, \ ? \ )$
$y = -2(-2)^2 - 8(-2)$
$y = -8 + 16$
$y = 8$ $(-2, 8)$
$y = -2(-1)^2 - 8(-1)$
$y = -2 + 6$ $(-1, 4)$

⑬ Solve $x^2 = 224$.

$\sqrt{x^2} = \sqrt{224}$

$\boxed{x = \pm 4\sqrt{14}}$

224
2 | 112
2 | 56
2 | 28
2 | 14
2 | 7

⑭ Factor $9x^2 + 30x + 25$

PERFECT SQUARES

$(3x+5)(3x+5) \rightarrow \boxed{(3x+5)^2}$

check: $9x^2 + 15x + 15x + 25$

$9x^2 + 30x + 25 \checkmark$

⑮ The area of a computer screen is $x^2 + 5x - 24$. Find the length & width.

$A = l \cdot w$

* FACTOR

Two numbers that

mult $\rightarrow -24$

add $\rightarrow 5$

+8 and -3

$\boxed{(x+8)(x-3)}$

⑯ Describe the exponential function:

a) $f(x) = (0.75)^x$

* DECAY because .75 < 1
* RATE of .25 or 25% $(1 - 0.75 = .25)$

b) $f(x) = (1.3)^x$

* GROWTH because 1.3 > 1
* RATE of .3 or 30% $(1 + .3 = 1.3)$

⑰ Classify as rational or irrational.

* decimal that never terminates or repeats

a) $\sqrt{15} = 3.8729...$ [IRRATIONAL]

b) $\sqrt{16} = 4$ [RATIONAL]

c) $\sqrt{27} = 5.19615$ [IRRATIONAL]

⑱ $\sqrt{3} \cdot \sqrt{5} = \sqrt{15}$ → IRRATIONAL

$\sqrt{6} \cdot \sqrt{6} = \sqrt{36} = 6$ → RATIONAL

$\sqrt{12} \cdot \sqrt{3} = \sqrt{36} = 6$ → RATIONAL

⑲ Rational numbers are closed under _addition_ and _multiplication_.

⑳ Find where the quantities are equal.

$(200, 30)$
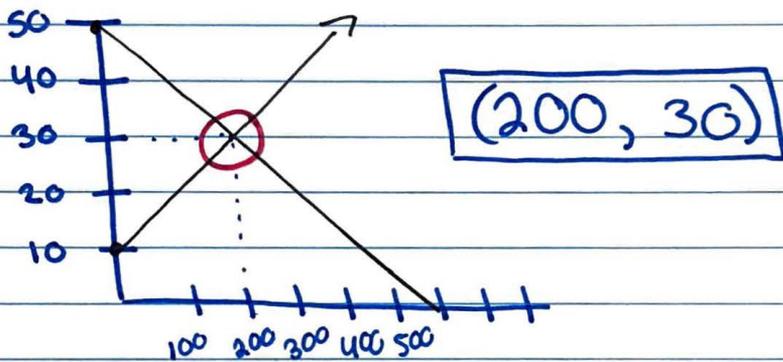
㉑ Find the perimeter.

$7x^2 - 3x + 4$

$2x$

$3x + 5$
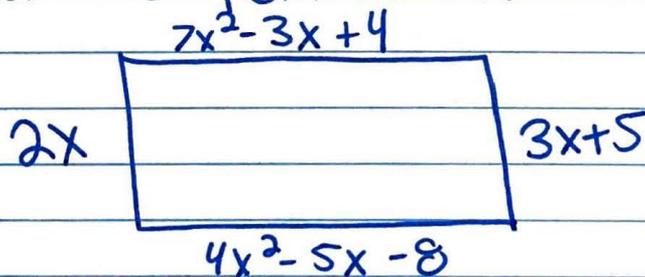
$4x^2 - 5x - 8$

＊Add all 4 sides.

$2x + 7x^2 - 3x + 4 + 3x + 5 + 4x^2 - 5x - 8$

$11x^2 - 3x + 1$

㉒ Solve $\sqrt{z} = 4\sqrt{8}$

$(\sqrt{z})^2 = (4\sqrt{8})^2$

$z = 4\sqrt{8} \cdot 4\sqrt{8}$

$z = 16\sqrt{64}$

$z = 16 \cdot 8$

$z = 128$

(23) What is the value of...

a) $25^{1/2} = \sqrt[2]{25} = \boxed{5}$

b) $144^{1/2} \qquad = \boxed{12}$

c) $196^{1/2} \qquad = \boxed{14}$

(24) Solve $\quad a^{3/4} = \sqrt[12]{a}^x$

$$a^{3/4} = a^{x/12}$$

$$\frac{3}{4} = \frac{x}{12}$$

$$4x = 36$$

$$\boxed{x = 9}$$

(25) The expression / formula $b^2 - 4ac$ is called the...

$$\boxed{\text{DISCRIMINANT}}$$

(26) a) If $b^2 - 4ac$ is negative $^{(<0)}$ → no solution
b) If $b^2 - 4ac$ is zero → one solution
c) If $b^2 - 4ac$ is positive → two solutions

(27) Let $x^2 - y^2 = 60$ and $x - y = 10$. What is the value of $x + y$?

$$x^2 - y^2 = 60$$
$$(x+y)(x-y) = 60$$
$$(x+y)(10) = 60$$

$$\frac{10(x+y)}{10} = \frac{60}{10}$$

$$\boxed{x + y = 6}$$

28 Let the expression $x^2 + mx + c$ be a perfect square trinomial. What is the value of "c"?

$$\left(\frac{b}{2}\right)^2 = \boxed{\left(\frac{m}{2}\right)^2}$$

29 The maximum height of a bouncy ball is $b(x) = 13(0.75)^x$.
Describe the domain and what $x = 0$ means.

* $x = 0$ means you haven't bounced the ball yet, so it's starting height is 13.

$$b(0) = 13(0.75)^0$$
$$= 13(1)$$
$$= 13$$

* The domain is the # of bounces, so all nonnegative whole numbers.

Graph: Cost ($) vs Weight (oz). Y-axis values 0.50, 1.00, 1.50, 2.00, 2.50. X-axis values 1, 2, 3, 4, 5.
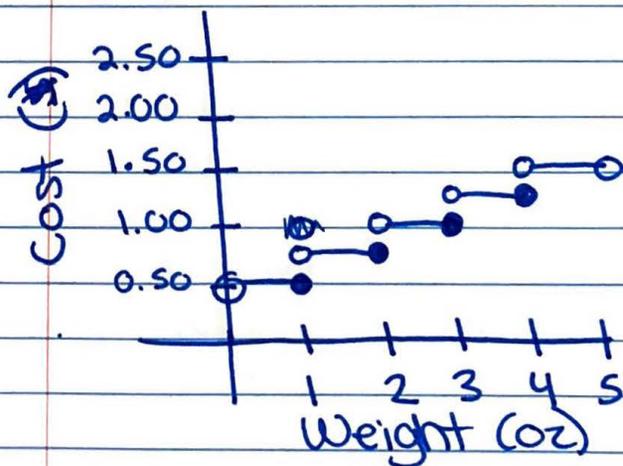
30 How much does a letter weighing < 1oz cost? $\boxed{0.50}$
31 How much does a 4oz letter cost? $\boxed{\$1.25}$
32 What is the increase in cost per oz.? $\boxed{\$0.25}$

③③ The number of cell phones is initially C. This number grows by 15% each year. Write an expression to show this.

$$y = a \, (1 \pm r)^{t} \leftarrow \text{time}$$

← rate

initial + growth
amount − decay

$$y = C \, (1 + .15)^{t}$$
$$\boxed{y = C(1.15)^{t}}$$

③④ The first 5 terms of a sequence are...

$$27, \; 9, 3, 1, \tfrac{1}{3}, \tfrac{1}{9}, \ldots$$

a_0 a_1

Write an equation to find the nth term.

$$y = mx + b$$
$$y = dn + a_0$$

common   "zero"
difference   term

$$a_0 = 27$$
$$r = \tfrac{1}{3}$$

$$y = a_0 (r)^n$$
$$y =$$
$$y = 27 \left(\tfrac{1}{3} \right)^n$$

35 Graph $y = |x+3| - 2$
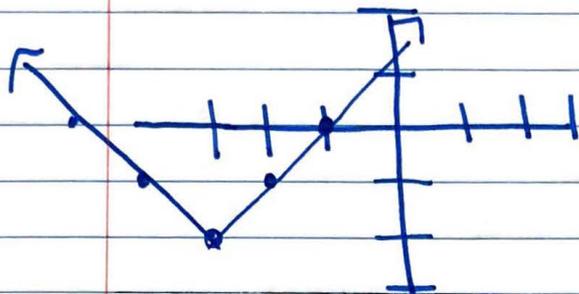
$(*h, k)$
$(-3, -2)$

*Absolute value ~ V-shaped

36 A parabola is defined as $f(x) = a(x-8)^2 + 12$ where a is positive. As a decreases, what happens to the y-coordinate of the vertex?

$$y = a(x-h)^2 + k$$

stretch/ shrink/ flip ← vertex

| NOTHING |

37 Piece-wise Function
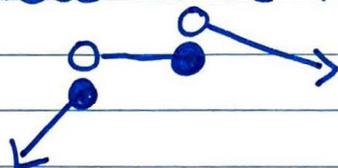
○ open dot $<, >$
● closed dot $\leq, \geq, =$

38 Solve $x^2 = 14 + 3x$

$x^2 - 3x - 14 = 0$
$a=1 \quad b=-3 \quad c=-14$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-14)}}{2(1)}$$

$$x = \frac{3 \pm \sqrt{9 + 56}}{2}$$

$$\boxed{x = \frac{3 \pm \sqrt{65}}{2}}$$ ← not a perfect square... doesn't reduce

(39)

X	0	1	2	3
f(x)	700	840	1008	1209.6
g(x)	700	736	772	808
h(x)	700	720	740	760

Are the functions f(x), g(x), h(x) linear or exponential?

f(x) → $\frac{840}{700}=1.2$, $\frac{1008}{840}=1.2$, etc EXPONENTIAL

g(x) → add 36   LINEAR

h(x) → add 20   LINEAR

(40) If $J=\frac{1}{3}q_r p^2$, solve for p.

mult by 3 $3J=q_r p^2$

div by q_r $\frac{}{q_r}$ $\frac{}{q_r}$

square root $\sqrt{\frac{3J}{q_r}} = \sqrt{p^2}$

$$\boxed{\sqrt{\frac{3J}{q_r}} = p}$$

(41) f(x) is linear with a negative slope. g(x) is a quadratic function with a negative leading coefficient. As "x" gets bigger, what happens?
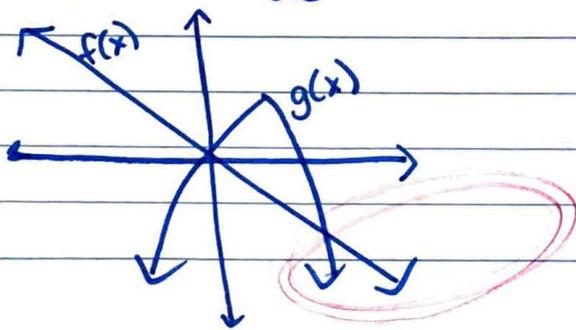
f(x) > g(x)

(f(x) is greater than g(x))

(42) SYSTEMS OF EQUATIONS

* no solutions
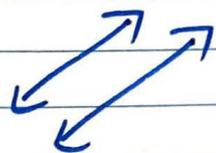
parallel lines → same slope

$$y = \tfrac{1}{3}x + 4$$
$$y = \tfrac{1}{3}x - 2$$

*** infinite solutions**

overlapping lines → same slope, same y-int

$$y = \tfrac{1}{3}x + 2$$
$$y = \tfrac{1}{3}x + 2$$

* one solution

intersecting lines ⤫ different slopes
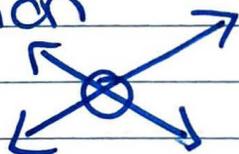
$$y = \tfrac{1}{3}x + 4$$
$$y = 2x - 3$$

(43) Graph the $f^{-1}(x)$

X	-3	-1	2	4	0
f(x)	4	-3	2	0	1

* inverse function, switch the x and the y / f(x)

$(4,-3), (-3,-1), (2,2), (0,4), (1,0)$