CONVERSIONS

1 inch = 2.54 centimeters	1 kilometer = 0.62 mile	1 cup = 8 fluid ounces
1 meter = 39.37 inches	1 pound = 16 ounces	1 pint = 2 cups
1 mile = 5280 feet	1 pound = 0.454 kilograms	1 quart = 2 pints
1 mile = 1760 yards	1 kilogram = 2.2 pounds	1 gallon = 4 quarts
1 mile = 1.609 kilometers	1 ton = 2000 pounds	1 gallon = 3.785 liters
		1 liter = 0.264 gallon
		1 liter = 1000 cubic centimeters

FORMULAS

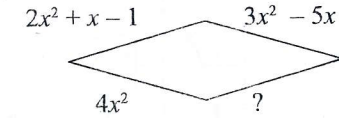|			
Triangle	$A = \frac{1}{2}bh$	Pythagorean Theorem	$a^2 + b^2 = c^2$
Parallelogram	$A = bh$	Quadratic Formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Circle	$A = \pi r^2$	Arithmetic Sequence	$a_n = a_1 + (n-1)d$
Circle	$C = \pi d$ or $C = 2\pi r$	Geometric Sequence	$a_n = a_1 r^{n-1}$
General Prisms	$V = Bh$	Geometric Series	$S_n = \frac{a_1 - a_1 r^n}{1 - r}$ where $r \neq 1$
Cylinder	$V = \pi r^2 h$	Radians	$1 \text{ radian} = \frac{180}{\pi} \text{ degrees}$
Sphere	$V = \frac{4}{3}\pi r^3$	Degrees	$1 \text{ degree} = \frac{\pi}{180} \text{ radians}$
Cone	$V = \frac{1}{3}\pi r^2 h$	Exponential Growth/Decay	$A = A_0 e^{k(t - t_0)} + B_0$
Pyramid	$V = \frac{1}{3}Bh$		

Part I

Answer all 24 questions in this part. Each correct answer will receive 2 credits. No partial credit will be allowed. For each question, write on the space provided the numeral preceding the word or expression that best completes the statement or answers the question.

1. What are the values of x in the equation $x(x - 6) = 4(x + 6)$? *roots*
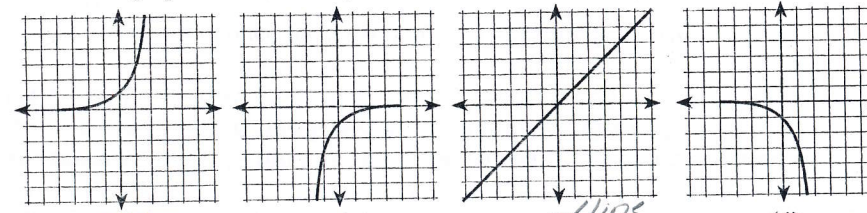(1) $\{-6, 6\}$　　(2) $\{-12, 2\}$　　(3) $\{-2, 12\}$　　(4) $\{-6, 0, 6\}$　　1 ___3___

2. Which of ordered pairs is *not* a function? *x can't repeat*
(1) $\{(0, 9),(9, 0),(1, 2),(3, 4)\}$　　(3) $\{(2, 3),(3, 4),(4, 5),(5, 6)\}$
(2) $\{(0, 1),(-1, 0),(1, 2),(3, 2)\}$　　(4) $\{(2, 3),(2, 4),(4, 5),(4, 6)\}$　　2 ___4___

3. If $f(x) = |3x - 4| + 2$, find $f(-10)$.
(1) 28　　(2) 34　　(3) 36　　(4) 38　　3 ___3___

4. What is the value of the 1st quartile in the data set below? *calc/stat/4*
Scores on a math quiz: 65, 90, 100, 72, 88, 55, 73
(1) 65　　(2) 73　　(3) 90　　(4) 55　　4 ___1___

5. What is the length of the missing side of the quadrilateral shown if the perimeter is $5x^2 + 2x + 1$?
(1) $4x^2 - 6x + 2$　　(3) $-4x^2 + 8x + 4$
(2) $-4x^2 + 6x + 2$　　(4) $4x^2 + 8x - 4$　　5 ___2___

6. What is the product of $(x + 1)$ and $(2x^2 + 3x - 1)$?
(1) $2x^2 + 5x^2 - x - 1$　　(3) $2x^3 + 3x^2 + 3x + 1$
(2) $2x^3 + 5x^2 + 2x - 1$　　(4) $2x^3 + 3x^2 - 3x - 1$　　6 ___2___

7. Which graph is a correct representation of the function $f(x) = 3^x$? *Calc*

(1)　　(2)　　(3) *line*　　(4)　　7 ___1___

8. A sequence has an initial value of 10 and each term is twice the previous term. Which function models this sequence?
(1) $a(n) = 10(2)^n$　　(3) $a(n) = 10 + 2n$
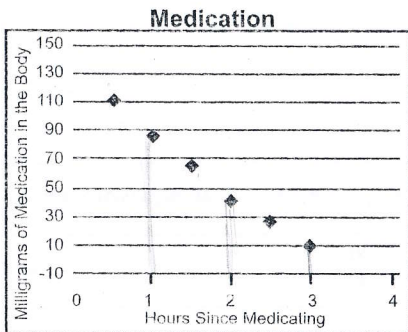(2) $a(n) = 10(2)^{n-1}$　　(4) $a(n) = 10 + 2(n - 1)$　　8 ___2___

9. How can $b^2 + 9b + 14$ be re-written?
(1) $(b + 7)(b - 7)$ (3) $(b + 7)(b - 2)$
(2) $(b - 7)(b - 2)$ (4) $(b + 7)(b + 2)$ 9 __4__

10. The scatter plot to the right shows the number of milligrams of a medication in a person's body for first three hours after the medication is given. Which equation best models the relationship where h is hours after medication and m is milligrams of medication in the body?

Medication

(1) $m = -h + 130$
(2) $m = -h - 130$
(3) $m = -40h + 130$
(4) $m = -40h - 130$ 10 __3__

11. Using the equation $y = ax^2 + bx + c$ to represent a parabola on a graph, which statement is true?
(1) If b is negative, the parabola opens downward.
(2) If a is negative, the parabola opens upward.
(3) If a is positive, the parabola opens upward.
(4) If c is negative, the parabola opens downward.   11 __3__

$a > 0$

12. If the function $h(x)$ represents the number of full hours that it takes a person to assemble x sets of tires in a factory, which would be an appropriate domain for the function?
(1) the set of real numbers   (3) the set of integers
(2) the set of negative integers   (4) the set of non-negative integers   12 __4__
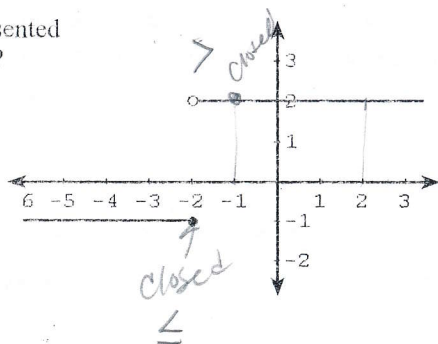
$h \mid h(x)$
tires $\mid$ hours

13. Given the length of three sides of a triangle, which is a right triangle?
(1) 10, 26, 24   (2) 20, 12, 18   (3) 30, 15, 26   (4) 40, 50, 80   13 __1__

14. Which equation is represented by the accompanying graph?
(1) $y = \begin{cases} -1; x < -2 \\ 2; x > -2 \end{cases}$

(2) $y = \begin{cases} -1; x \le -2 \\ 2; x > -2 \end{cases}$

(3) $y = \begin{cases} -1; x < -2 \\ 2; x \ge -2 \end{cases}$

(4) $y = \begin{cases} -1; x \le -2 \\ 2; x \ge -2 \end{cases}$ 14 __2__

closed   closed

15. A mouse population starts with 2,000 mice and grows at a rate of 5% per year. The number of mice after t years can be modeled by the equation, $P(t) = 2000(1.05)^t$. What is the average rate of change in the number of mice between the second year and the fifth year, rounded to the *nearest whole number*?
(1) 116   (2) 348   (3) 2205   (4) 2553   15 __1__

16. Seven less than the product of twice a number is greater than 5 more than the same number. Which integer satisfies this inequality?
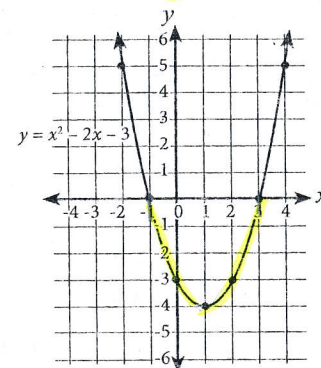(1) 1   (2) 2   (3) 12   (4) 13   16 __4__

17. A sequence is defined recursively by $f(1) = 16$ and $f(n) = f(n - 1) + 2n$. Find $f(4)$.
(1) 32   (2) 30   (3) 28   (4) 34   17 __4__

18. Which statement is true about the accompanying graph?
(1) It is decreasing when $-1 < x < 3$ and positive when $x > 1$.
(2) It is increasing when $x > 1$ and negative when $x < 0$.
(3) It is increasing when $x > 1$ and negative when $-1 < x < 3$.
(4) It is decreasing when $-1 < x < 3$ and positive when $x > 3$.   18 __3__

$y = x^2 - 2x - 3$

19. The two-way table below represents the travel history of the seniors in the local Travel Club.

Travel Club History			
	Gender		Total
	Men	Women	
Aruba	14	19	33
Jamaica	17	18	35
Canada	32	22	54
Spain	4	11	15
Total	67	70	137

$\frac{54}{137} = 39\%$

What is the approximate marginal relative frequency of the number of men and women that have traveled to Canada?
(1) 16%   (2) 23%   (3) 39%   (4) 42%   19 __3__

20. What is the equation of the line with a slope of $-\frac{1}{2}$ that passes through the point $(6, -6)$?
(1) $y = -\frac{1}{2}x - 3$ (2) $y = \frac{1}{2}x - 3$ (3) $y = -\frac{1}{2}x + 3$ (4) $y = -2x - 3$ 20 __1__

calc

ALGEBRA 1
Test 1

21. Alex makes ceramic bowls to sell at a monthly craft fair in a nearby city. Every month, she spends $50 on materials for the bowls from a local art store. At the fair, she sells each completed bowl for a total of $25 including tax. Which equation expresses Alex's profit as a function of the number of bowls that she sells in one month?

(1) $p(x) = 50x + 25$ (3) $p(x) = 25x$

(2) $p(x) = 15x + 25$ (4) $p(x) = 25x - 50$ *spent*

                     ↑ *spent*   21 __4__

22. Which expression is equivalent to $x^4 - y^4$? → *DOTS*

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

(2) $(x^2 - y^2)(x^2 - y^2)$ (4) $(x^2y^2) - (x^2y^2)$ 22 __1__

23. A bottle rocket that was made in science class had a trajectory path that followed the quadratic equation $y = -x^2 + 4x + 6$. What is the turning point of the rocket's path?

(1) $(1, 5)$ (2) $(2, 10)$ (3) $(-2, -10)$ (4) $(1, -5)$ 23 __2__

24. What is the solution to this system of linear equations:
$$y - x = 4 \text{ and } y + 2x = 1?$$

(1) $(-1, 3)$ (2) $(0, 4)$ (3) $(1, -1)$ (4) $(-3, 3)$ 24 __1__

Part II

Answer all 8 questions in this part. Each correct answer will receive 2 credits. Clearly indicate the necessary steps, including appropriate formula substitutions, diagrams, graphs, charts, etc. For all questions in this part, a correct numerical answer with no work shown will receive only 1 credit. All answers should be written in the space provided. [16]

25. Find the *slope* average rate of change of the function shown to the right that represents the amount of money in a savings account in Lender's Bank?

Week	Balance
1	$128
2	$142
3	$156
4	$170
5	$184

$$m = \frac{\Delta y}{\Delta x} = \frac{14}{1}$$

$14 / week

26. Factor completely, the expression: $2x^3 - 2x^2 - 12x$

1.) $x(x-6)=4(x+6)$

$x^2-6x=4x+24$

$-4x-24 \quad 4x-24$

$x^2-10x-24=0$

$(x+2)(x-12)=0$

$x=-2 \quad x=12$

choice 3

3.) $f(-10)=|3(-10)-4|+2$

$f(-10)=|-34|+2$

$f(-10)=36$

5.) $2x^2+x-1$

$3x^2-5x$

$+4x^2$

perimeter of 3 sides → $9x^2-4x-1$

$5x^2+2x+1$

$-9x^2+4x+1$

$-4x^2+6x+2$

6.)

	$2x^2$	$+3x$	-1
x	$2x^3$	$+3x^2$	$-x$
$+1$	$+2x^2$	$+3x$	-1

$=2x^3+5x^2+2x-1$

geometric

8.) $a_1=10 \times 2 \quad a_n=10 \cdot (2)^{(n-1)}$

$a_2=20 \times 2$

$a_3=40 \times 2$

$a_4=80$

9.) $b^2+9b+14$

$(b+2)(b+7)$

13.) use the Pyth. th.

$10^2+24^2 \overset{?}{=} 26^2$

$676=676 ✓$

15.)

x	y
2	2205
5	2552.6

$m=\frac{\Delta y}{\Delta x}=\frac{348}{3}=116$

16.) $2x-7 > x+5$

$-x \quad -x$

$x-7 > 5$

$+7 \quad +7$

$x > 12$

$\leftarrow | \quad | \quad \overset{13}{0)} \rightarrow$

$-b \quad 0 \quad 18$

17.) $f(n)=f(n-1)+2n$

$f(2)=f(1)+2(2)$

$f(2)=16+4=20$

$f(3)=f(2)+2(3)$

$=20+6=26$

$f(4)=f(3)+2(4)$

$=26+8=\boxed{34}$

point-slope
formula

20.) $y - y_1 = m(x - x_1)$

$y - (-6) = -\frac{1}{2}(x - 6)$

$y + 6 = -\frac{1}{2}x + 3$

$\underline{\quad -6 \qquad\qquad -6 \quad}$

$y = -\frac{1}{2}x - 3$

22.) $x^4 - y^4$

$(x^2 - y^2)(x^2 + y^2)$

23.) $y = -x^2 + 4x + 6$

vertex $= (2, 10)$
$\qquad\quad$ max

24.) $-(y - x = 4)$

$\qquad y + 2x = 1$

$-y + x = -4$

$\underline{y + 2x = 1}$

$\dfrac{3x}{3} = \dfrac{-3}{3}$

$x = -1$

$y - (-1) = 4$

$y + 1 = 4$

$y = 3$

$(-1, 3)$