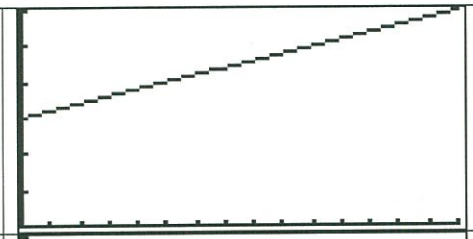
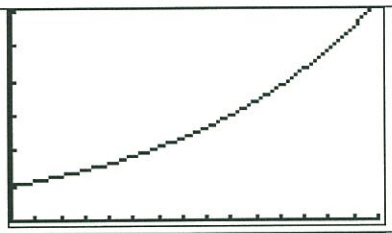
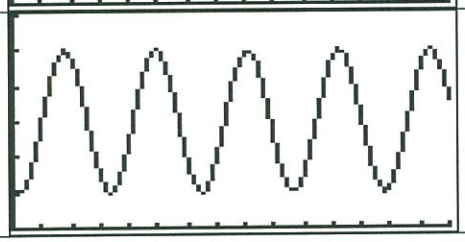
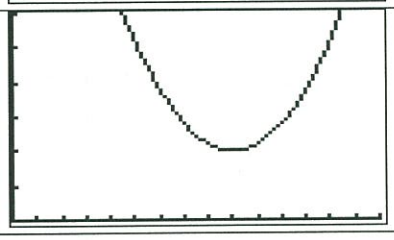
PART A Short Answer

1. Identify the following types of functions, giving the range and domain of each. Assume that the function extends to infinity and the given scale is 1 to 1. Also give one real-world example of each type of function. Your example does not need to fit the data – only the general type of function.

I 

II 

III 

IV 

	Function Type or Name	Domain	Range	Example
I	linear	$x \in \mathbb{R}$	$y \in \mathbb{R}$	taxi fare
II	exponential	$x \in \mathbb{R}$	$y > 0$	population growth
III	sinusodial periodic	$x \in \mathbb{R}$	$1 \leq y \leq 5$	tides
IV	quadratic	$x \in \mathbb{R}$	$y \geq 2$	suspension bridge

2. Calculate first and second differences and identify the type of function

x	y
1	-5
2	-4
3	-1
4	4
5	11

1	
3	2
5	2
7	2

Quadratic

x	y
-1	0
0	1
1	1
2	2
3	2

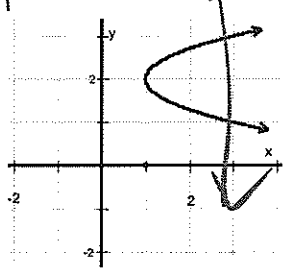
3. Write $\frac{a^2 \times a^5}{a^4}$ as a single power.

$a^7 \div a^4 = a^3$

4. Identify each of the following as a function or non-function.

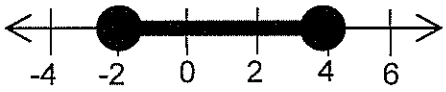
a) Function

b)



Non-function

5. Give the following domain in set notation.



$D = \{x \in \mathbb{R} \mid -2 \leq x \leq 4\}$

6. Given $f(x) = -2x + 1$, find $f(1) - 3f(-2)$

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

$f(-2) = -2(-2) + 1 = 5$

$f(1) - 3f(-2)$

$= -1 - 3(5)$

$= -1 - 16 = -17$

7. Factor fully $2x^2 - 2x - 24$.

$= 2(x^2 - x - 12)$

$= 2(x - 4)(x + 3)$

8. State the zeros of $g(x) = -x(x+5)$

x = 0, x = - 5

9. State the range of $y = -x^2 + 2$

$y \leq 2$

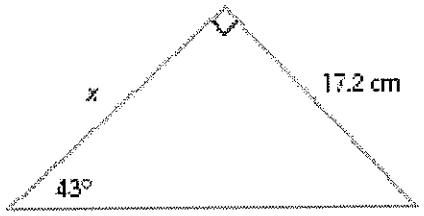
10. Find 14% of $325.

$\$325 \times 0.14 = \$45.50$

11. Find Θ to the nearest degree if sin(Θ) = 0.25

$\sin^{-1}(0.25) \doteq 14.47 \doteq 14^\circ$

12. Solve for x in the triangle.

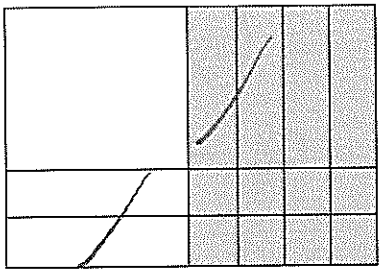


$\tan 43^\circ = \frac{17.2}{x}$

$x = \frac{17.2}{\tan 43} \doteq \frac{17.2}{0.9325}$

$\doteq 18.4$ cm

13. The algebra tiles area model represents a quadratic where □ is positive and ▨ is negative.



Write the equation of the quadratic in;

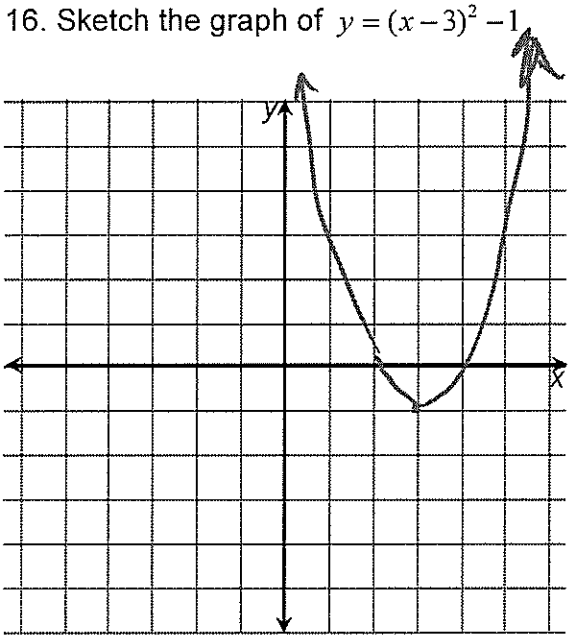
a) standard form

$y = x^2 - 2x - 8$

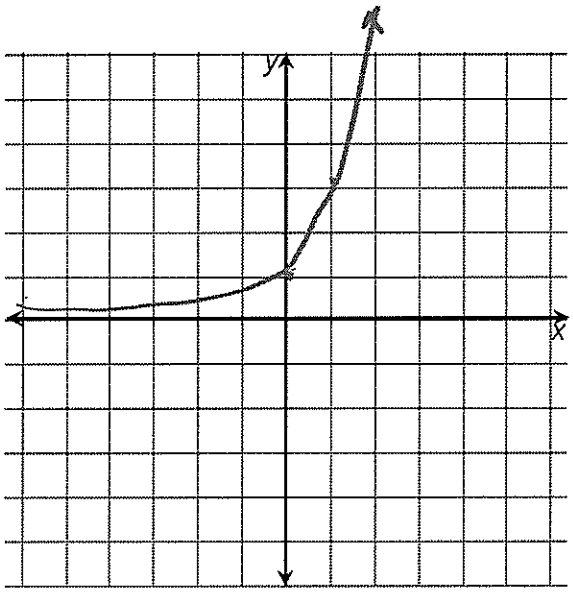
b) factored form.

$y = (x-4)(x+2)$

16. Sketch the graph of $y = (x-3)^2 - 1$



17. Sketch the graph of $y = 3^x$.



18. Find the ***number*** of real roots of $g(x) = -4x^2 + 5x - 3$

Discriminant = b^2-4ac

$= (5)^2-4(-4)(-3)$

$= 25 - 48$

$= -23$ therefore no real roots

PART B Long Answer

19. Given $h(x) = x^2 + 5x - 24$, find the

a) y-intercept

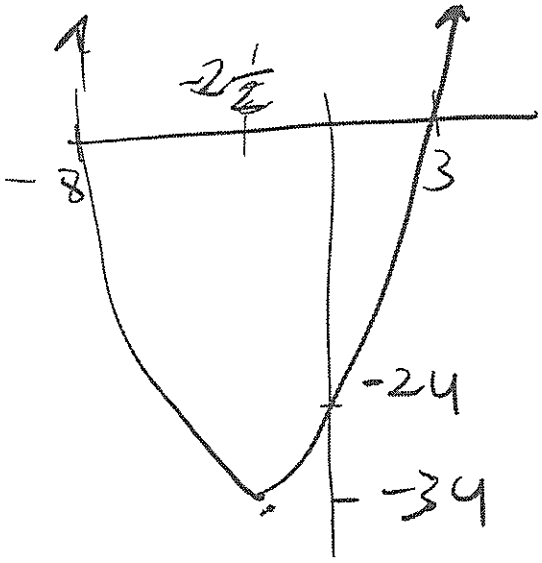
$f(0) = -24$

b) zeros

$x^2 + 5x - 24$

$= (x+8)(x-3)$

$x = \{-8, 3\}$



c) vertex

$x\text{ coordinant} = \frac{-b}{2a} = \frac{-5}{2}$

$f(-\frac{5}{2}) = (-\frac{5}{2})^2 + 5(-\frac{5}{2}) - 24$

$= \frac{10}{4} - \frac{25}{2} - 24$

$= \frac{5}{2} - \frac{25}{2} - \frac{48}{2} = \frac{-68}{2} = -34$

vertex is $(-2.5, -34)$

20. Find the equation of the quadratic functions that has zeros of -1 and 5 and passes through the point (-3, -32).

$y = a(x+1)(x-5)$

sub in $(-3, -32)$

$-32 = a(-3+1)(-3-5)$

$-32 = a(-2)(-8)$

$-32 = a(16)$

$a = \frac{-32}{16} = -2$

$f(x) = -2(x+1)(x-5)$

21. The following table shows the depth of glacier ice over time. If this trend continues,

a) Find the depth at 7 years.

$25 \times 0.8 = 20$

b) Find the equation of the function.

$f(x) = 95(0.8)^x$

Time(years)	Depth(m)
0	95
1	76
2	61
3	49
4	40
5	31
6	25
7	20

Ratio

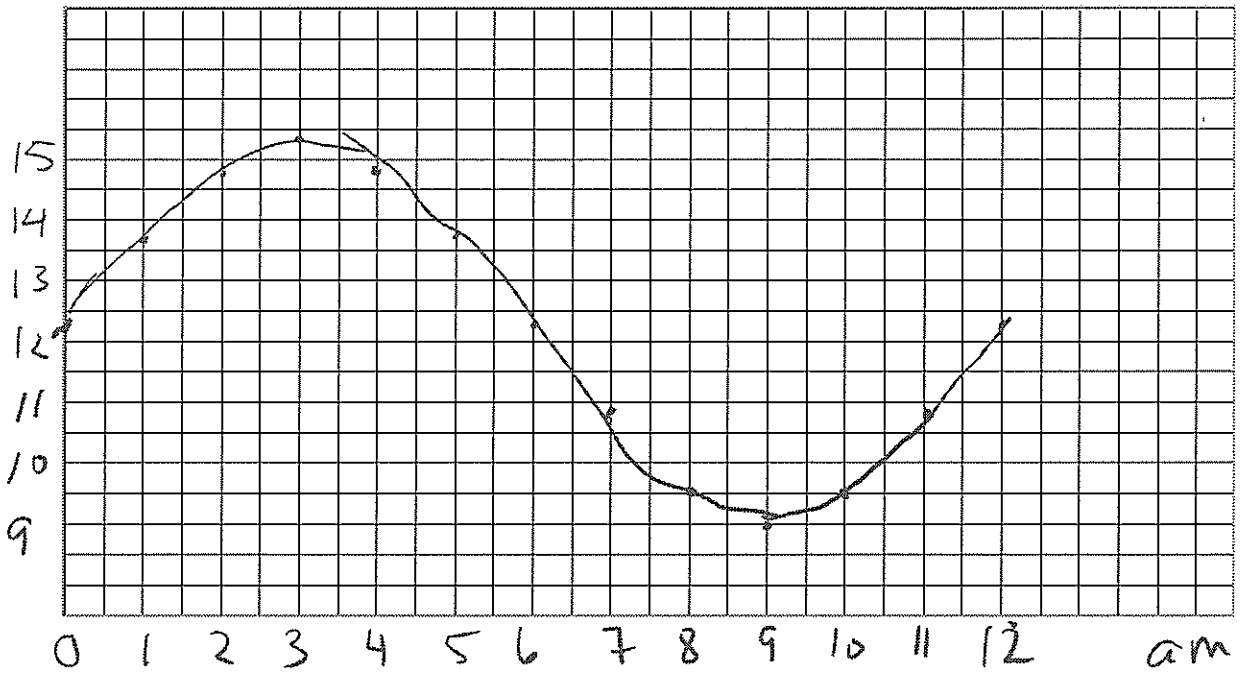
0.8, 0.8, 0.8, 0.8, 0.8, 0.8

22. The following chart shows the number of daylight hours on the 21st day of each month for a one year cycle.

0 1 2 3 4 5 6 7 8 9 10 11

Month	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
Hours	12.2	13.7	14.9	15.4	14.9	13.7	12.2	10.8	9.5	9.0	9.5	10.8

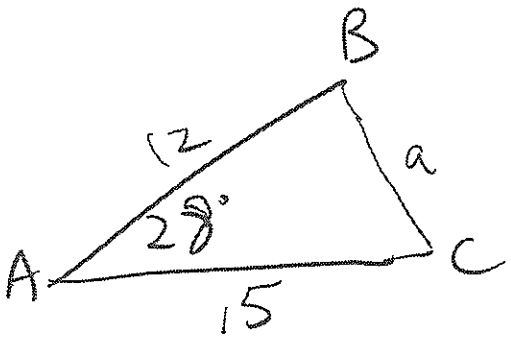
a) Plot the points and draw the line of best fit.



b) Find an equation to model the data.

$f(x) = 3.2 \sin(x) + 12.2$

23. Given triangle ABC, where b = 15, c = 12 and angle A = 28°, find side length a.



$a^2 = b^2 + c^2 - 2bc\cos A$

$= 15^2 + 12^2 - 2(12)(15)\cos 28$

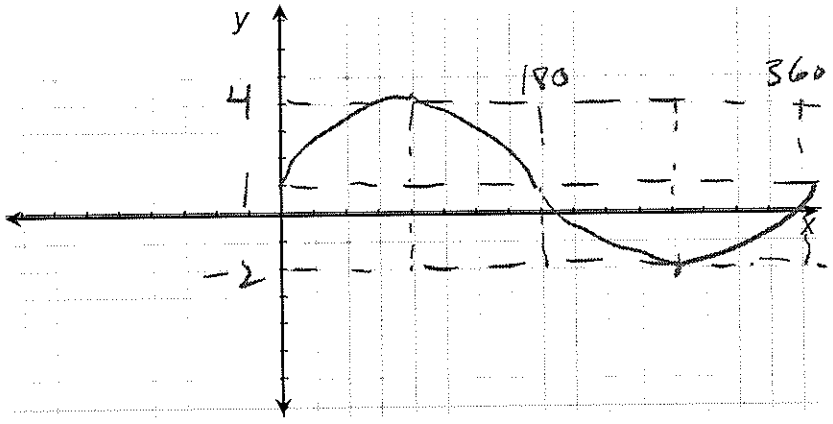
$\doteq 225 + 144 - 360(0.8829)$

$\doteq 369 - 317.8$

$\doteq 51.2$

$a \doteq \sqrt{51.2} \doteq 7.2$

24. Sketch $y = 3\sin(x) + 1$ for one cycle.



25.

Compounded annually

$y=10\,000(1.06)^x$

$y=10\,000(1.06)^{10}$
$= 17\,908.48$

Compounded monthly

$y=10\,000(1+.06/12)^x$
$= 10\,000(1.005)^x$
$= 10\,000(1.005)^{10*12}$
$= 10\,000(1.005)^{120}$
$= 18\,193.97$

Therefore compounded monthly yields more interest compared to compounded annually, given the same annual interest rate.

26.

Start at age 20
N = 45
I = 6
PV = 0
PMT = - 1 000
FV = 212 743.51
P/Y = 1
C/Y = 1

Start at age 50
N = 15
I = 6
PV = 0
PMT = - 3000
FV = 69 827.91
P/Y = 1
C/Y = 1

Investing early pays off !

27. A bacteria culture doubles every 5 hours.
a) Write the equation of the growth function if there are 500 bacteria to start.

$f(x) = 500(2)^x$

b) How many bacteria will there be after 20 hours?

$\frac{20}{5} = 4$ growth periods $f(4) = 500(2)^4$
$= 500(16) = 8000$

c) When will there be one million bacteria?

0 1 2 3 4 5 6 7
500, 1000, 2000, 4000, 8000, 16000, 32000, 64000
8 9 10 11
128000, 256000, 512000, 1024000

$11 \times 5\text{hrs} = 55\text{hrs}$
approx.