PDP Geo & Adv Alg w/ Trig
Quadratics Unit Test   /44   Name _____ *Key* _____

Date _____ CP ___

Part I – IB Studies Questions

$b^2 - 4ac$

$1 - 4(1)(6)$
$1 + 24 = 25$

$4 - 4(3)(5)$
$4 - 60$

1. Consider the following equations:

$y = x^2 + x - 6$

(i) $y = 7x + x^2$;   (ii) $y = (x - 2)(x + 3)$;   (iii) $y = 3x^2 - 2x + 5$;   (iv) $y = 5 - 3x - 2x^2$.

Which of these equations has a graph that:

(a) has a y-intercept below the x-axis?

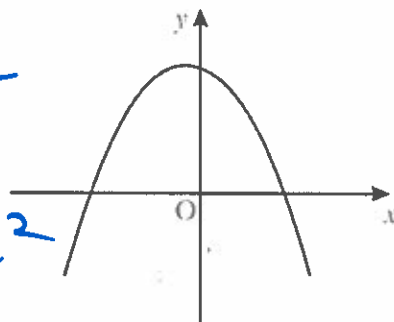$ii \qquad y = (x - 2)(x + 3)$

(b) passes through the origin?

$i \qquad y = 7x + x^2$

(c) does not cross the x-axis?
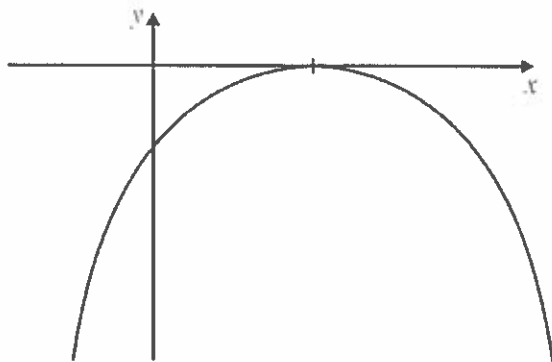
$iii \qquad y = 3x^2 - 2x + 5$

(d) could be represented by the diagram to the right?

$iv \qquad y = 5 - 3x - 2x^2$

(Total 8 marks)

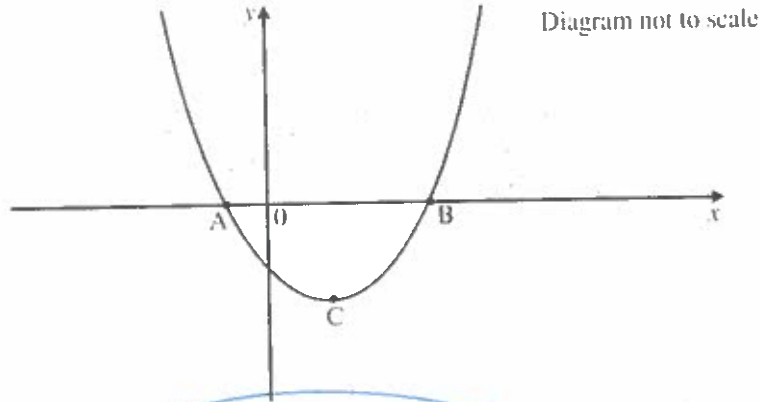2. The diagram shows the graph of the function $y = ax^2 + bx + c$.

Complete the table below to show whether each expression is positive, negative or zero.

(Total 4 marks)

Expression	positive	negative	zero
a		✓	
c		✓	
$b^2 - 4ac$			✓

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V1 1

The graph of the function $f(x) = x^2 - 2x - 3$ is shown in the diagram below.

Diagram not to scale

(a) Factorize the expression $x^2 - 2x - 3$. (3)

$$0 = (x + 1)(x - 3)$$

$$x + 1 = 0 \qquad x - 3 = 0$$
$$x = -1 \qquad x = 3$$

(b) Write down the coordinates of the points A and B. (3)

$$A: (-1, 0) \qquad B: (3, 0)$$

(c) Write down the equation of the axis of symmetry. (2)

$$x = \frac{-b}{2a} \qquad \boxed{x = 1}$$

$$= \frac{2}{2(1)}$$

(d) Write down the coordinates of the point C, the vertex of the parabola. (2)

$$1^2 - 2(1) - 3$$
$$1 - 2 - 3$$
$$1 - 5$$
$$-5 - 4$$

$$\boxed{(1, -4)}$$

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(Total 10 marks)

Part II - Physics Real World Problem

The height h (in feet) of a certain rocket t seconds after it leaves the ground is modeled by
$h(t) = -16(t - 3)^2 + 159$.

a. Find the maximum height of the rocket. **Explain** your answer using mathematical evidence and
academic vocabulary from the quadratics unit. (3)

159 feet.

b. How many seconds after the rocket leaves the ground does it reach its maximum height? **Explain** your
answer using mathematical evidence and academic vocabulary from the quadratics unit. (3)

3 seconds

$$\begin{array}{r} 3 \\ 16 \\ \times 6 \\ \hline 96 \\ ^5 16 \\ 9 \\ 144 \end{array}$$

c. **Expand** the equation given above and express it in standard form. (2)

$$h(t) = -16(t-3)(t-3) + 159$$
$$= -16(t^2 - 6t + 9) + 159$$
$$= -16t^2 + 96t - 144 + 159$$
$$= -16t^2 + 96t + 15$$

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V1 3

$$h(t) = -16t^2 + 96t + 15$$

d. After exactly how many seconds does the rocket return to the ground? Express your answer in fully simplified, exact terms. (3)

$$X = \frac{-96 \pm \sqrt{96^2 - 4(-16)(15)}}{2(-16)}$$

$$X = \frac{-96 \pm \sqrt{10176}}{-32}$$

$$X = \frac{-96 \pm 6\sqrt{159}}{-32}$$

$$X = \frac{12 \pm \sqrt{159}}{4}$$

$$X = \frac{-48 \pm 3\sqrt{159}}{-16}$$

10176	2
5088	2
2544	2
1272	2
636	2
318	2
159	3
53	53
1	

96
× 96
576
864
☺

e. Was the rocket launched from ground level? **Explain** your answer using mathematical evidence and academic vocabulary from the quadratics unit. (3)

No!

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Part III – Multiple Choice

For problems 1 – 4 below, circle the correct answer. Show all work for credit where appropriate.

1) Which are the factors of $y = x^2 - 3x - 18$?

A. $(x-6)^2$
B. $(x+9)(x-2)$
C. $(x+6)(x-3)$
D. $(x+3)(x-6)$

$$(x+3)(x-6)$$

2) Find the value of c that makes $x^2 + 10x + c$ a perfect square.

A. 100
B. 25
C. 10
D. 50

3) The quadratic equation $x^2 - 8x = -20$ is to be solved by completing the square. Which equation would be the first step in that solution?

A. $x^2 - 8x + 20 = 0$
B. $x^2 - 8x + 16 = -20 + 16$
C. $x(x-8) = -20$
D. $x^2 - 8x + 64 = -20 + 64$

4) Simplify $(-2-i)(4+i)$.

A. $-7 - 6i$
B. $-9 - 6i$
C. $-8 + 7i$
D. $-8 - 6i$

$$-8 - 2i - 4i - i^2$$
$$-8 - 6i + 1$$
$$-7 - 6i$$

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V1 5