Curve Sketching (National 5)

1. Write the following in the form $y = (x + p)^2 + q$

a. $y = x^2 + 8x + 7$ b. $y = x^2 - 6x + 12$ c. $y = x^2 - 8x + 7$ d. $y = x^2 + 6x - 12$

e. $y = x^2 + 10x - 13$ f. $y = x^2 + 12x$ g. $y = x^2 + 7x + 3$ h. $y = x^2 - 3x + 6$

2. State the axis of symmetry and the coordinate of the y-intercept and turning point for each of the graphs in question 1.

3. Sketch each of the graphs in question 1.

4. Factorise each of the graphs.

a. $y = x^2 - 4x - 12$ b. $y = x^2 - 4x - 32$ c. $y = x^2 - 8x + 12$ d. $y = x^2 + 12x + 20$

e. $y = x^2 + 6x - 16$ f. $y = x^2 - 4x - 21$ g. $y = x^2 - 16$ h. $y = x^2 - 49$

5. Find the coordinate of the y-intercept, the roots, axis of symmetry and turning point for each of the graphs in question 4.

6. Skecth each of the graphs for the curves in question 4.

7. What do you expect to be different with the graphs below, compared to all the graphs we have sketched above?

a. $y = -(x + 3)^2 + 12$ b. $y = -(x - 3)^2 + 13$ c. $y = -(x - 2)^2 + 7$ d. $y = -(x - 4)^2 + 10$

e. $y = -(x + 8)(x - 4)$ f. $y = -(x - 3)(x + 7)$ g. $y = -(x + 8)(x - 10)$ h. $y = -x(x + 5)$

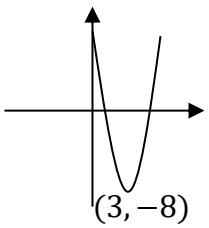
8. Sketch each of the curves in question 7

9. Sketch each of the following graphs (showing the roots, y-intercept, axis of symmetry and turning point).

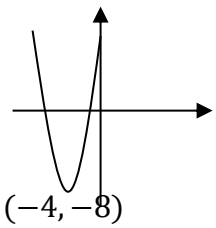
a. $y = x^2 + 8x$ b. $y = x^2 - 6x$ c. $y = x^2 + 10x$ d. $y = x^2 - 12x$

10. Write the equation of each of the graphs below in the form $y = a(x + p)^2 + q$ and find the y intercept.

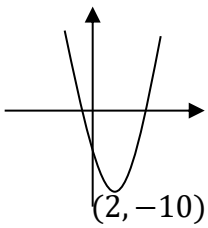
a.



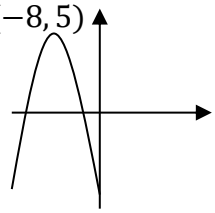
b.



c.

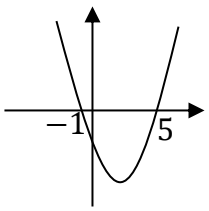


d.

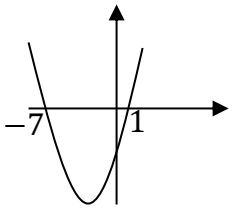


11. Write the equation of each of the graphs below in the form $y = a(x + b)(x + c)$ and find the y intercept.

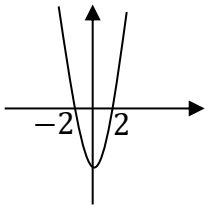
a.



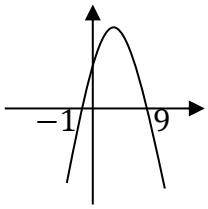
b.



c.



d.



ANSWERS

Question 1

1. $y = (x+4)^2 - 9$

b. $y = (x-3)^2 + 3$

c. $y = (x-4)^2 - 9$

d. $y = (x+3)^2 - 21$

e. $y = (x+5)^2 - 36$

f. $y = (x+6)^2 - 36$

g. $y = \left(x + \frac{7}{2}\right)^2 - \frac{37}{4}$

h. $y = \left(x - \frac{3}{2}\right)^2 + \frac{15}{4}$

Question 2

a. $x = -4$

$(-4, -9)$

$(0, 7)$

b. $x = 3$

$(3, 3)$

$(0, 12)$

c. $x = 4$

$(4, -9)$

$(0, 7)$

d. $x = -3$

$(-3, -21)$

$(0, -12)$

e. $x = -5$

$(-5, -36)$

$(0, -13)$

f. $x = -6$

$(-6, -36)$

$(0, 0)$

g. $x = -\frac{7}{2}$

$\left(-\frac{7}{2}, -\frac{37}{4}\right)$

$(0, 3)$

h. $x = \frac{3}{2}$

$\left(\frac{3}{2}, \frac{15}{4}\right)$

$(0, 6)$

Question 4

a. $y = (x-6)(x+2)$

b. $y = (x-8)(x+4)$

c. $y = (x-6)(x-2)$

d. $y = (x+10)(x+2)$

e. $y = (x+8)(x-2)$

f. $y = (x-7)(x+3)$

g. $y = (x-4)(x+4)$

h. $y = (x+7)(x-7)$

Question 5

a. $(6, 0)$ and $(-2, 0)$

$x = 2$

$(2, -16)$

$(0, -12)$

b. $(8, 0), (-4, 0)$

$x = 2$

$(2, -36)$

$(0, -32)$

c. $(6, 0), (2, 0)$

$x = 4$

$(4, -4)$

$x = 12$

d. $(-10, 0), (-2, 0)$

$x = -6$

$(-6, -16)$

$(0, 20)$

e. $(-8, 0), (2, 0)$

$x = -2$

$(-2, -36)$

$(0, -16)$

g. $(7, 0), (-3, 0)$

$x = 2$

$(2, -25)$

$(0, -21)$

h. $(4, 0), (-4, 0)$

$x = 0$

$(0, -16)$

$(0, -16)$

i. $(-7, 0), (7, 0)$

$x = 0$

$(0, -49)$

$(0, -49)$

Question 7

The graphs in questions 1-6 have a minimum turning point and the graphs in question 7 have a maximum turning point.

Question 8

a. $x = -3$

$(-3, 12)$

$(0, 3)$

b. $x = 3$

$(3, 13)$

$(0, 4)$

c. $x = 2$

$(2, 7)$

$(0, 3)$

d. $x = 4$

$(4, 10)$

$(0, -6)$

e. $(-8, 0), (4, 0)$

$x = -2$

$(-2, 36)$

$(0, 32)$

f. $(3, 0), (-7, 0)$

$x = -2$

$(-2, 25)$

$(0, 21)$

g. $(-8, 0), (10, 0)$

$x = 1$

$(1, -81)$

$(0, 80)$

h. $(0, 0), (-5, 0)$

$x = -\frac{5}{2}$

$\left(-\frac{5}{2}, \frac{25}{4}\right)$

$(0, 0)$

Question 9

a. $(0, 0), (-8, 0)$

$x = -4$

$(-4, -16)$

$(0, 0)$

b. $(0, 0), (6, 0)$

$x = 3$

$(3, -9)$

$(0, 0)$

c. $(0, 0), (-10, 0)$

$x = -5$

$(-5, -25)$

$(0, 0)$

d. $(0, 0), (12,0)$

$x = 6$

$(6, -36)$

$(0, 0)$

Question 10

a. $y = (x - 3)^2 - 8$

$(0, 1)$

b. $y = (x + 4)^2 - 8$

$(0, 8)$

c. $y = (x - 2)^2 - 10$

$(0, -6)$

d. $y = -(x + 8)^2 + 5$

$(0, -59)$

Question 11

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

$(0, -5)$

b. $y = (x + 7)(x - 1)$

$(0, -7)$

c. $y = (x + 2)(x - 2)$

$(0, -4)$

d. $y = -(x + 1)(x - 9)$

$(0, 9)$