

## Week 4 – Tutorial 1 Exercises

Solving quadratics using the formula:-

The 2 possible solutions to:  $ax^2 + bx + c = 0$  are . . . .  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

To find them:

Step 1: write down the values of the co-efficients **a**, **b** and **c** to start your working.

Step 2: Find the *discriminant* ,  $\Delta = b^2 - 4ac$  as a separate calculation.

Step 3: The solutions are . . . .  $x_1 = \frac{-b + \sqrt{\Delta}}{2a}$  and  $x_2 = \frac{-b - \sqrt{\Delta}}{2a}$

EXERCISE – Solve using the quadratic formula:

(1)  $3x^2 - 7x - 2 = 0$

(2)  $x^2 + 6x = 3$

(3)  $6x^2 - 10 = \frac{x}{2}$

(4)  $n(2n + 9) = -3$

(5)  $8x^2 = 5 - 6x$

(6)  $2x^2 - 4x - 1 = 0$

## EXERCISES – Quadratic Functions

For the following quadratic functions find:

- (a) is it concave up or down?
- (b) what is the  $y$ -intercept?
- (c) what are the  $x$ -intercepts?
- (d) what is the axis of symmetry?
- (e) what are the co-ordinates of the vertex?

7.  $y = x^2 - 6x + 8$

8.  $y = 9 - x^2$

9.  $y = x^2 + 2$

10.  $y = 12 - x - x^2$

11.  $y = 2x^2 - 3x - 9$

12.  $y = x^2 + 6x + 7$

### Answers:

(1)  $x = \frac{7 \pm \sqrt{73}}{6}$     (2)  $x = -3 \pm 2\sqrt{3}$     (3)  $x = \frac{4}{3}$  or  $-\frac{5}{4}$     (4)  $n = \frac{-9 \pm \sqrt{57}}{4}$

(5)  $x = \frac{1}{2}$  or  $-\frac{5}{4}$     (6)  $x = \frac{2 \pm \sqrt{6}}{2}$     (7) up ; (0,8) ; (4,0) & (2,0) ;  $x=3$  ;  $V=(0,2)$

(8) down ; (0,9) ; (3,0) & (-3,0) ;  $x=0$  ;  $V=(0,9)$     (9) up ; (0,2) ; None ;  $x=0$  ;  $V=(0,2)$

(10) down ; (0,12) ; (3,0) & (-4,0) ;  $x=-\frac{1}{2}$  ;  $V = (-\frac{1}{2}, 12\frac{1}{4})$

(11) up ; (0,-9) ; (3,0) &  $(-\frac{3}{2}, 0)$  ;  $x=\frac{3}{4}$  ;  $V = (\frac{3}{4}, -10\frac{1}{8})$

(12) up ; (0,7) ;  $x = -3 \pm \sqrt{2}$  ;  $x = -3$  ;  $V = (-3, -2)$

## EXERCISES: The Discriminant

### EXERCISES 12(b)

1. Calculate the discriminant of each of the following equations and hence state whether the equations have two, one or no roots.

(a)  $x^2 + 6x + 2 = 0$

(b)  $2x^2 + 3x + 4 = 0$

(c)  $4x^2 - 12x + 9 = 0$

(d)  $-3x^2 + 2x - 1 = 0$

(e)  $2x^2 = 3x + 7$

(f)  $4x^2 - 20x + 25 = 0$

2. Without sketching the graphs of the following functions, determine whether they cross the  $X$ -axis or not.

(a)  $y = x^2 - 5x + 2$

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

(c)  $y = x^2 - 6x + 9$

(d)  $y = 8 - 3x - 2x^2$

(e)  $y = 3x^2 + 2x + 5$

(f)  $y = -x^2 - x - 1$

Calculate the discriminant of each of the following equations to help you to decide the technique to use to solve the equations. Hence solve them (3. to 22.)

3.  $x^2 + 2x = 15$

4.  $x^2 - 9x - 5 = 0$

5.  $12x^2 = 25x - 12$

6.  $4x^2 - 12x + 9 = 0$

7.  $7x^2 = 63$

8.  $x^2 - 6x = 0$

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

10.  $x^2 = 4(x - 24)$

11.  $2x^2 - x = 5$

12.  $3x^2 = 2x + 2$

13.  $3x^2 - 7x - 3 = 0$

14.  $(x + 6)^2 = x + 6$

15.  $4x^2 = 9x - 4$

16.  $9x^2 + 24x + 16 = 0$

17.  $3x^2 + 4x = 5$

18.  $2x^2 + x - 4 = 0$

19.  $x^2 = 15x - 56$

20.  $x(2x - 3) = 0$

21.  $2x^2 + 5x + 1 = 0$

22.  $5x^2 - 7x + 2 = 0$

## Answers

### EXERCISES 12(b)

1. (a) 28, two (b) -23, none (c) 0, one (d) -8, none (e) 65, two (f) 0, one

2. (a) yes (b) no (c) touches (d), yes (e) no (f) no

3. 64; 3, -5

4. 101;  $\frac{9 \pm \sqrt{101}}{2}$

5. 49;  $\frac{3}{4}, 1\frac{1}{4}$

6. 0;  $1\frac{1}{2}$

7. 1764;  $\pm 3$

8. 36; 0, 6

9. 0; 1

10. -368; none

11. 41;  $\frac{1 \pm \sqrt{41}}{4}$

12. 28;  $\frac{-1 \pm \sqrt{7}}{3}$

13. 85;  $\frac{7 \pm \sqrt{85}}{6}$

14. 1; -5, -6

15. 17;  $\frac{9 \pm \sqrt{17}}{8}$

16. 0;  $-1\frac{1}{3}$

17. 76;  $\frac{-2 \pm \sqrt{19}}{3}$

18. 33;  $\frac{-1 \pm \sqrt{33}}{4}$

19. 1; 7, 8

20. 9; 0,  $1\frac{1}{2}$

21. 17;  $\frac{-5 \pm \sqrt{17}}{4}$

22. 9; 1,  $\frac{2}{5}$

### EXERCISE 5.7 — Sketching Parabolae

1. Sketch

(a)  $y = x^2$

(b)  $y = -x^2$

(c)  $y = 3x^2$

(d)  $f(x) = x^2 + 1$

(e)  $y = x^2 - 3$

(f)  $y = x^2 + x$

(g)  $f(x) = x^2 - 2x$

(h)  $y = x^2 - 4$

(i)  $y = -x^2 + 1$

(j)  $g(x) = x^2 + 5x + 6$

2. Find the intercepts on the  $x$ - and  $y$ -axes for the curve

$y = x^2 - 7x + 12$ . Sketch the curve, using these points to help you.

3. Find the  $x$ -intercepts and  $y$ -intercept

of  $y = -x^2 + 3x + 4$ . Sketch the curve, using the  $x$ -intercepts and  $y$ -intercept to help you.

4. Sketch  $y = x^2$  and  $y = 4$  on the same set of coordinate axes and find where they intersect.

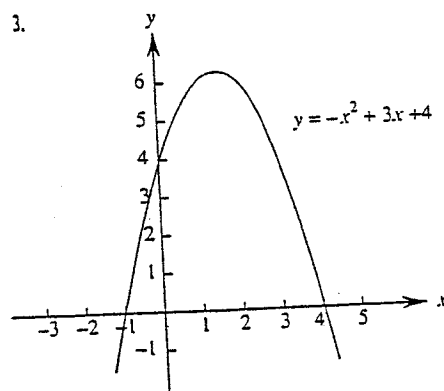
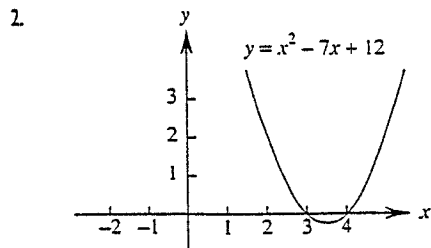
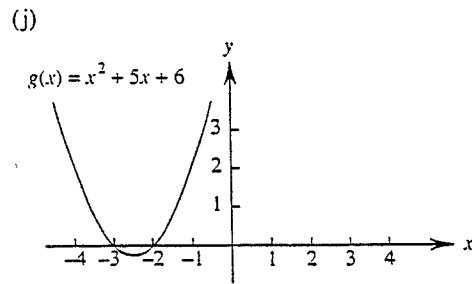
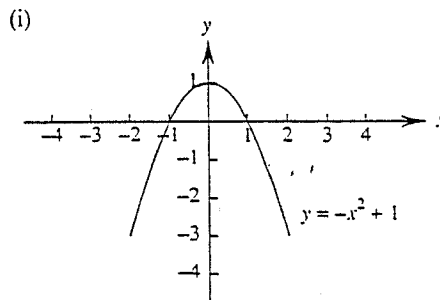
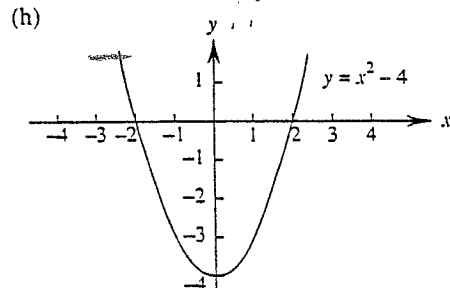
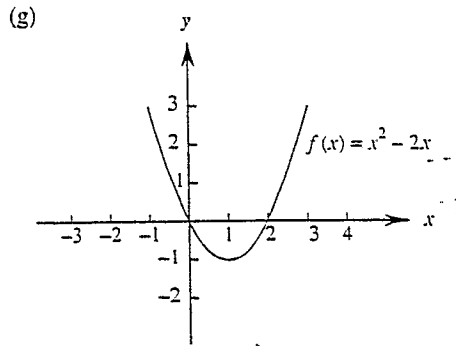
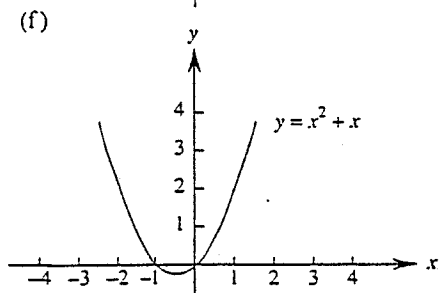
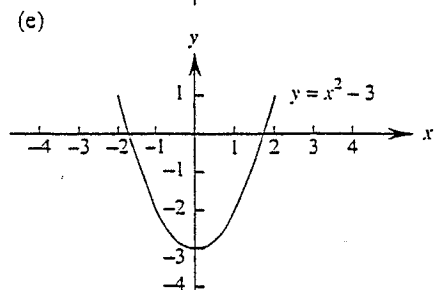
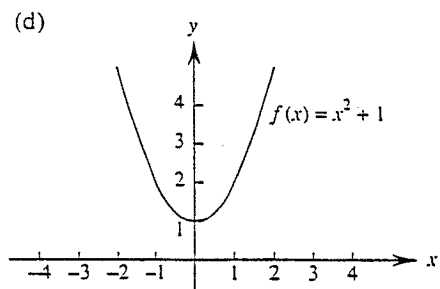
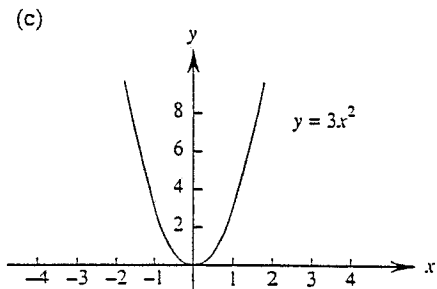
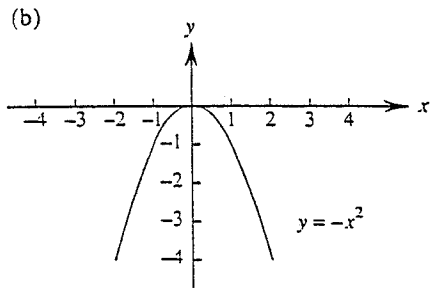
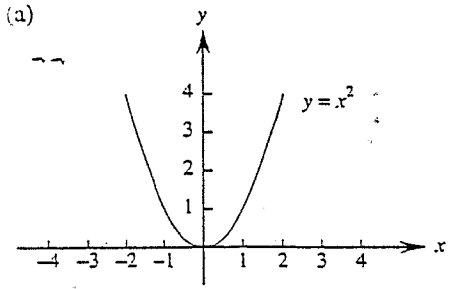
5. Sketch  $y = x^2 - 4x + 3$  and  $y = x - 1$  on the same number plane. Find the coordinates of their points of intersection.

6. Draw the graphs of  $y = x^2$  and  $y = (x - 1)^2$  on the same set of axes.

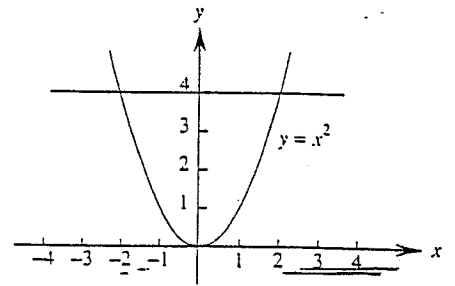
Answers on  
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# Answers

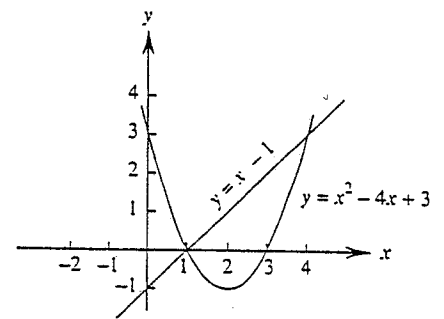
## EXERCISE 5.7



4. (2, 4) and (-2, 4)



5. (1, 0) and (4, 3)



6.

