

9. Using the sign of the discriminant, indicate the number of solutions to the following equations.
- a)  $2x^2 + 3x - 2 = 0$   $\Delta = 25$ ; 2 solutions
  - b)  $-2x^2 - 5x + 3 = 0$   $\Delta = 49$ ; 2 solutions
  - c)  $4x^2 + 12x + 9 = 0$   $\Delta = 0$ ; 1 solution
  - d)  $-x^2 + x - 1 = 0$   $\Delta = -3$ ; 0 solution
  - e)  $x^2 - 6x = 0$   $\Delta = 36$ ; 2 solutions
  - f)  $2x^2 - 8 = 0$   $\Delta = 64$ ; 2 solutions
  - g)  $x(x - 3) = -2$   $\Delta = 1$ ; 2 solutions
  - h)  $-x^2 + 2x - 1 = 0$   $\Delta = 0$ ; 1 solution
10. Solve the equations of the preceding exercise using the discriminant method.
- a)  $s = -\frac{2}{1}z - \frac{2}{1}$  b)  $s = -\frac{3}{1}z - \frac{3}{1}$  c)  $s = -\frac{2}{3}z - \frac{2}{3}$  d)  $s = 0$
  - e)  $s = 10, 6t$  f)  $s = -2, 2t$  g)  $s = -1, 2t$  h)  $s = -11$

$3x^2 - 11x - 4 = 0$ <ul style="list-style-type: none"> <li>• <math>a = 3, b = -11, c = -4</math></li> <li>• <math>\Delta = b^2 - 4ac = (-11)^2 - 4 \times 3 \times -4</math></li> <li>• <math>\Delta = 169</math></li> <li>• <math>x_1 = \frac{-b - \sqrt{\Delta}}{2a} = \frac{-(-11) - 13}{6} = -1</math></li> <li>• <math>x_2 = \frac{-b + \sqrt{\Delta}}{2a} = \frac{-(-11) + 13}{6} = 4</math></li> </ul> <p>Thus, <math>S = \left\{ -1, \frac{3}{4} \right\}</math>.</p>	$x^2 - 6x + 9 = 0$ <ul style="list-style-type: none"> <li>• <math>a = 1, b = -6, c = 9</math></li> <li>• <math>\Delta = b^2 - 4ac = (-6)^2 - 4 \times 1 \times 9</math></li> <li>• <math>\Delta = 0</math></li> <li>• <math>x = \frac{-b}{2a} = \frac{6}{2} = 3</math></li> </ul> <p>Thus, <math>S = \{3\}</math>.</p>	$x^2 - x + 1 = 0$ <ul style="list-style-type: none"> <li>• <math>a = 1, b = -1, c = 1</math></li> <li>• <math>\Delta = b^2 - 4ac = (-1)^2 - 4 \times 1 \times 1</math></li> <li>• <math>\Delta = -3</math></li> </ul> <p>Thus, <math>S = \emptyset</math>.</p>
--	--	--

Sign of $\Delta$	Number of solutions	Solutions
$\Delta > 0$	2 solutions	$x_1 = \frac{-b - \sqrt{\Delta}}{2a}$ and $x_2 = \frac{-b + \sqrt{\Delta}}{2a}$
$\Delta = 0$	1 solution	$x = \frac{-b}{2a}$
$\Delta < 0$	no real solution	

• The discriminant, noted  $\Delta$  (read delta), of the quadratic equation  $ax^2 + bx + c = 0$  is the real number:

$$\Delta = b^2 - 4ac$$

• The existence and number of real solutions depend on the sign of the discriminant  $\Delta$ .

8. Solve the following equations using the formulas stated in the theory box on page 32.
- a)  $x(-1)^2 + 9 = 0$   $s = 0$
  - b)  $2(x - 3)^2 = 0$   $s = 18t$
  - c)  $2x - 5t^2 - 25 = 0$   $s = 10, 5t$
  - d)  $2(x + 1)^2 - 14 = 0$   $s = -1 - t, -1 + t$
  - e)  $-2(2x + 1)^2 + 32 = 0$   $s = -\frac{5}{2}, \frac{3}{2}$
  - f)  $3(x - 2)^2 + 27 = 0$   $s = 0$