1) What is the solution of $x^2 + 4x > 0$, where x is a real number?

$x^2 + 4x > 0$

$y > 0$

by using the graph

$x > 0$ and $x < -4$ ✓

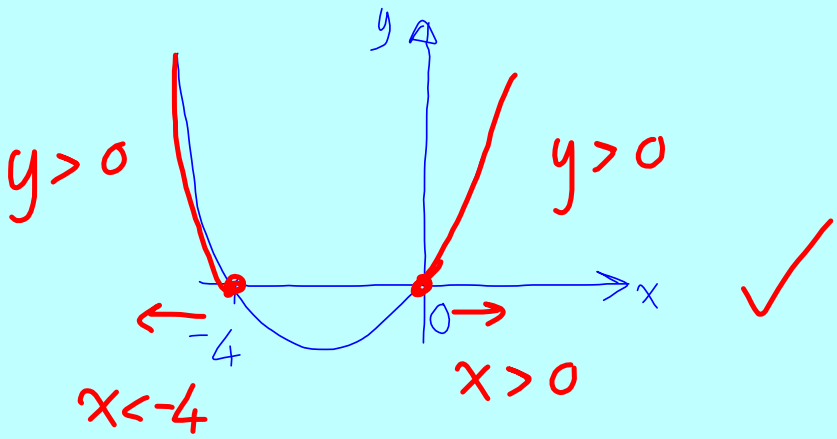
Roots

$x^2 + 4x = 0$

$x(x + 4) = 0$

$x = 0 \quad x = -4$ ✓

Graph



✓

2) The discriminant of a quadratic equation is 23.

Here are two statements about this quadratic equation:

(1) the roots are real; ✓

(2) the roots are rational. ✗

Which of the following is true?

A Neither statement is correct.

B Only statement (1) is correct.

C Only statement (2) is correct.

D Both statements are correct.

$b^2 - 4ac = 23$ So roots are real since $b^2 - 4ac \geq 0$

Statement 1 is correct.

Since 23 is not a square number the roots are irrational, so statement 2 is not correct.

(think of the quadratic formula which includes the discriminant. $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-b \pm \sqrt{23}}{2a}$ SURD

$\sqrt{23}$ is a surd which is irrational)

3)

If $f(x) = (x - 3)(x + 5)$, for what values of x is the graph of $y = f(x)$ above the x-axis?

$f(x) = (x-3)(x+5)$

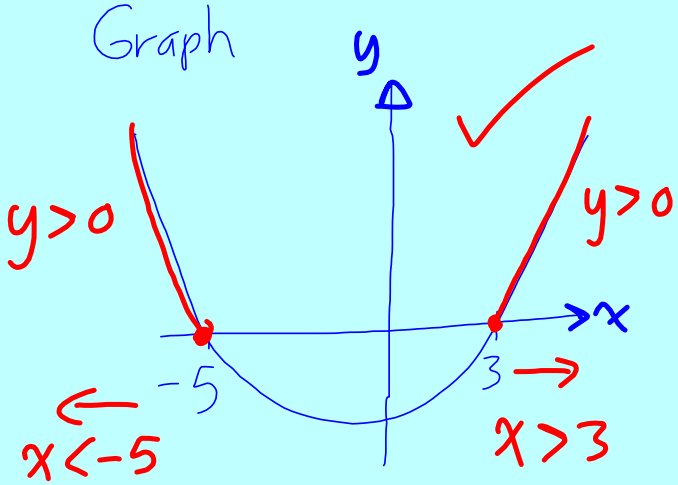
So $(x-3)(x+5) > 0$ ✓, since $y > 0$ above the x-axis

Using the graph

Roots are $x = 3, x = -5$

$x < -5$ and $x > 3$ ✓

Graph



4)

If $2x^2 - 12x + 11$ is expressed in the form $2(x - b)^2 + c$, what is the value of c?

$2x^2 - 12x + 11$

$= 2(x^2 - 6x) + 11$

$= 2(x - 3)^2 - 7$ ✓ ✓ ✓

So $c = -7$

5)

For what value of k does the equation $x^2 - 3x + k = 0$ have equal roots?

$b^2 - 4ac = 0$ ✓ $\quad a=1 \quad b=-3 \quad c=k$

$(-3)^2 - 4 \times 1 \times k = 0$ ✓

$9 - 4k = 0$ ✓

$4k = 9$

$k = \frac{9}{4}$ or $2\frac{1}{4}$ or $2{\cdot}25$ ✓

6)

Prove that the roots of the equation $2x^2 + px - 3 = 0$ are real for all values of p. **4**

You need to show that $b^2 - 4ac \geq 0$ regardless the value of p (all values of p)

$a = 2 \quad b = p \quad c = -3$

$b^2 - 4ac$

$= p^2 - 4 \times 2 \times (-3)$ ✓

$= p^2 + 24$ ✓

$p^2 + 24$ will always be > 0 for any value of p, so the roots will be real for all values of p. ✓

7)

(*a*) Show that the function $f(x) = 2x^2 + 8x - 3$ can be written in the form $f(x) = a(x + b)^2 + c$ where a, b and c are constants. **(3)**

(*b*) Hence, or otherwise, find the coordinates of the turning point of the function f. **(1)**

a) $2x^2 + 8x - 3$

$= 2(x^2 + 4x) - 3$ ✓

$= 2(x + 2)^2 - 11$ ✓ ✓ ✓

b) Min T.P

at $(-2, -11)$ ✓

8)

The roots of the equation $(x - 1)(x + k) = -4$ are equal.
Find the values of k. **(5)**

So $b^2 - 4ac = 0$ ✓

$(x-1)(x+k) = -4$

$x^2 + kx - x - k = -4$

$x^2 + kx - x + 4 - k = 0$ ✓

$x^2 + x(k-1) + 4 - k = 0$

So $a = 1 \quad b = k - 1 \quad c = 4 - k$

$b^2 - 4ac = 0$

$(k-1)^2 - 4 \times 1 \times (4-k) = 0$ ✓

$(k-1)(k-1) - 4(4-k) = 0$

$k^2 - 2k + 1 - 16 + 4k = 0$

$k^2 + 2k - 15 = 0$ ✓

$(k + 5)(k - 3) = 0$

$k = -5$ or $k = 3$ ✓