Find the value of the constant p such that the equation $x^2 + x + p = 0$ has equal roots.

Given that $q \neq 0$, find the value of the constant q such that the equation $x^2 + 2qx - q = 0$ has a repeated root.

The equation $x^2 + kx + 2 = 0$, where k is a constant has no real roots.

Find the set of possible values for k.

The equation $(k + 5)x^2 + 4x + (k + 2) = 0$, where k is a constant has two distinct real solutions for x.

Find the set of possible values for k.

Given that the x-axis is a tangent to the curve with the equation

$$y = x^2 + rx - 2x + 4,$$

find the two possible values of the constant r.

The curve with equation $y = px^2 - 4px - 5p$, where p is a constant does not intersect the line with equation $y = 2x - 12$.

(a) Show that $9p^2 - 8p + 1 < 0$

(b) Find the set of possible values for p.

The line $y = mx - 2$ is a tangent to the circle $x^2 + 6x + y^2 - 8y + 5 = 0$

Find the two possible values of m, giving your answers in exact form.

The line $y = mx + 2$ is a tangent to the circle $(x-5)^2 + (y+1)^2 = 15$

Find the two possible values of m, giving your answers in exact form.

The equation $x^2 + (n + 1)x + (3 - 3n) = 0$, where n is a constant has two distinct real roots.

Find the set of possible values for n.

The equation $kx^2 + 6kx + 2 = 0$, where k is a constant has no real roots.

Find the set of possible values for k.

The equation $x^2 + (n + 1)x + (3 - 3n) = 0$, where n is a constant has two distinct real roots.

Find the set of possible values for n.

The line $y = mx + 2$ is a tangent to the circle $(x - 5)^2 + (y + 1)^2 = 15$

Find the two possible values of m, giving your answers in exact form.