

No Calculator!! Box your final answer.

1. Solve $2x^2 + 4x - 20 = 0$ by completing the square.

$$2(x^2 + 2x) = 20$$

$$2(x^2 + 2x + (\frac{1}{2})^2) = 20 + (2)(\frac{1}{2})^2$$

$$2(x+1)^2 = 22$$

$$\sqrt{(x+1)^2} = \sqrt{11}$$

$$x = -1 \pm \sqrt{11}$$

2. Find m when the given equation, $mx^2 + (m+2)x + m = 0$ has a repeated root.

$$(m+2)^2 - 4m \cdot m = 0$$

$$m^2 + 4m + 4 - 4m^2 = 0$$

$$-3m^2 + 4m + 4 = 0$$

$$3m^2 - 4m - 4 = 0$$

$$(3m+2)(m-2) = 0$$

$$m = -\frac{2}{3} \text{ OR } m = 2$$

3. The given equation, $kx^2 + (k+2)x - k = 0$ has one root which is two more than the other root. Find the value of k and the two roots.

Roots: r & $2+r$ \Rightarrow $-1 \neq 1$

$$-\frac{k+2}{k} = 2r+2$$

$$\frac{-k+2}{k} = 2(-1)+2 = 0$$

$$k = 2$$

$$r(r+2) = \frac{-k}{k} = -1 \Rightarrow r^2 + 2r + 1 = 0$$

$$(r+1)^2 = 0$$

4. Write the quadratic equation, in standard form, with the roots of $\frac{2}{3}$ and $-\frac{1}{4}$ and passing the point (0, 1).

$$y = a(x - \frac{2}{3})(x + \frac{1}{4}) \quad \Leftarrow (0, 1)$$

$$1 = a(-\frac{2}{3})(\frac{1}{4}) \Rightarrow 1 = \frac{-a}{6}$$

$$a = -6$$

$$-\frac{2}{3} + \frac{1}{4}$$

$$-\frac{8+3}{12} = -\frac{11}{12}$$

$$y = -6(x - \frac{2}{3})(x + \frac{1}{4})$$

$$= -6(x^2 - \frac{5}{12}x - \frac{2}{12}) = -6x^2 + \frac{5}{2}x + 1$$

5. Given $y = -2x^2 + 5x - 2$;

a) Write the quadratic function in factored form and state the x-intercepts.

$$y = -(2x^2 - 5x + 2) = -(2x-1)(x-2)$$

$$\begin{array}{cc} 2x & -1 \\ x & -2 \end{array} \quad x = \frac{1}{2} \quad x = 2 \Rightarrow \left(\frac{1}{2}, 0\right) (2, 0)$$

b) Write the quadratic function in vertex form and state the coordinates of the vertex and its axis of symmetry.

$$y = -2 \left[x^2 - \frac{5}{2}x + \left(\frac{5}{4}\right)^2 \right] - 2 - (-2) \left(\frac{5}{4}\right)^2$$

$$= -2 \left[x - \frac{5}{4} \right]^2 - \frac{16}{8} + \frac{25}{8}$$

$$= -2 \left[x - \frac{5}{4} \right]^2 + \frac{9}{8} \Rightarrow \text{Vertex } \left(\frac{5}{4}, +\frac{9}{8} \right)$$

c) Graph the function showing x-intercepts, y-intercept, and vertex.

Axis of sym $x = \frac{5}{4}$

y-intercept: $(0, -2)$

