## Section 2: Dividing and factorising polynomials

### Exercise level 3 (Extension)

1. (i) The expression $(2x+1)$ is a factor of $f(x) = 2x^3 - 9x^2 + 7x + k$.
   Find the value of $k$.

   (ii) Solve the equation $f(x) = 0$.

2. (i) Show that $x = a$ and $x = a+2$ are roots of the equation
   $$x^3 - (2a+1)x^2 + (a^2 - 2)x + a(a+2) = 0$$
   and write the equation in fully factorised form.

   (ii) Write down in polynomial form an equation of a graph with intercepts given
   by $x = -1, \frac{2}{3}, \frac{8}{3}$ .

3. The diagram shows the graph $y = f(x)$ where $f(x)$ is a cubic polynomial.

   (i) Write down a factorised expression for $f(x)$,
   with the coefficient of the term in $x^3$ equal to 1.

   (ii) Suppose $f(2) = (a-2)^2$.
   Find the possible values of $a$, sketch both
   graphs on the same axes, and label the points
   with $x$-coordinate 2.
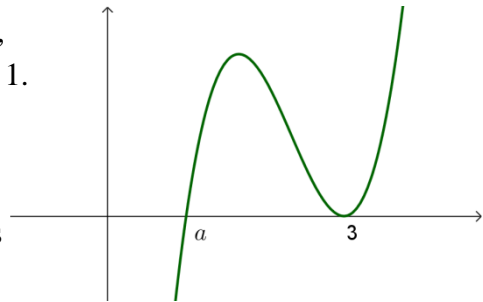
   

   (iii) Now suppose $f(1) = a^2 - 10a + 12$.
   Again, find the possible values of $a$, sketch both graphs on the same axes, and
   write down the points with $x$-coordinate 1.

   (iv) Both conditions in (ii) and (iii) apply. Write down the equation of the graph.