**Self-assessment answers: 3 Polynomials**

**1.** (a) *y* = *a*(*x* + 1)(*x* – 2)(*x* – 5)

*y* = −10 when *x* = 0 ⇒ −10 = *a*(1)(−2)(−5) ⇒ *a* = −1

∴ *y* = −(*x* + 1)(*x* – 2)(*x* – 5)

(b) *y* = *a*(*x* + 2)(*x* – 1)2

*y* = 6 when *x* = 0 ⇒ 6 = *a*(1)(2) ⇒ *a* = 3

∴ *y* = 3(*x* – 1)2(*x* + 2) *[6 marks]*

**2.** When *x* = 2: 3(2)3 – *a*(2)2 + 4(2) + *b* = 0 ⇒ 4*a* – *b* = 32

When *x* = −1: 3(−1)3 – *a*(−1)2 + 4(−1) + *b* = 3 ⇒ *a* – *b* = −10

Solving simultaneous equations: *a* = 14, *b* = 24*[4 marks]*

**3.** *a*3*x*3 + *a*2*x*2 + 5*x* + 12 = 0

⇒ 

Suppose the three real roots are *b*, *c* and *d*.

Then 

But *bcd* =  = −16 (product of the roots) ⇒ 

And *b* + *c* + *d* =  = 5(sum of the roots) ⇒  *[3 marks]*

**4.** The discriminant is zero: (−3)2 – 4(*k*)(6) = 0 ⇒ *k* = *[3 marks]*

**5.** *f*(−2) = 2(−8) + 3(4) – 12(−2) – 20 = −16 + 12 + 24 – 20 = 0, so (*x* + 2) is a factor.

2*x*3 + 3*x*2 – 12*x* – 20 = (*x* + 2)(2*x*2 + *cx* – 10)

= 2*x*3 + (*c* + 4)*x*2 + (2*c* – 10)*x* − 20

Comparing coefficients: *c* + 4 = 3 ⇒ *c* = −1

So *f*(*x*) = (*x* + 2)(2*x*2 – *x* – 10) = (*x* + 2)(2*x* – 5)(*x* + 2) = (*x* + 2)2(2*x* – 5)*[6 marks]*

**6.** The discriminant is: (*m* + 3)2 – 4(*m* + 1) = *m*2 + 2*m* + 5 = (*m* + 1)2 + 4 > 0 for all *m*.

Hence the graph always has two *x*-intercepts. *[5 marks]*