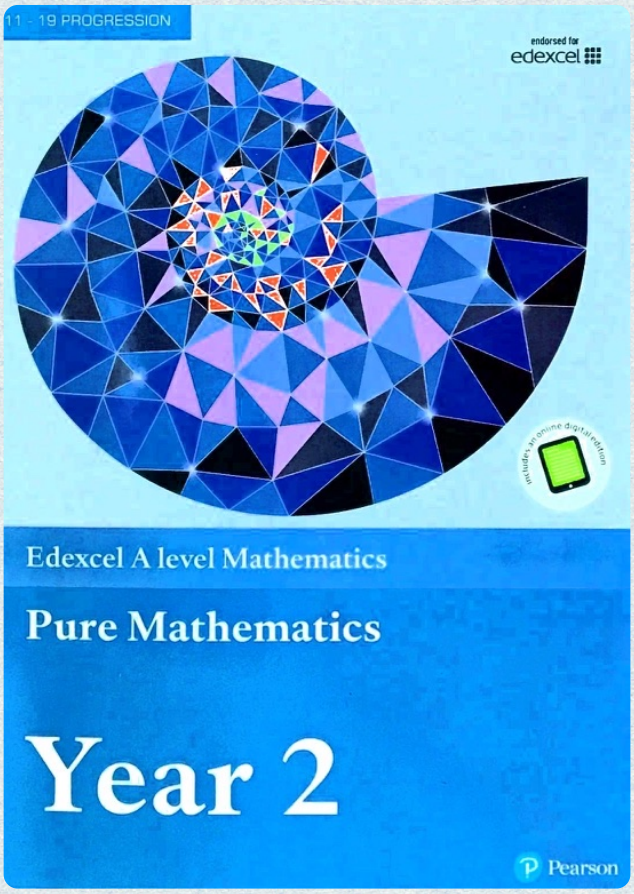

Chapter 1

Algebraic Methods

1.3 Partial Fractions 3

Repeated Linear Factors

E **2** $g(x) = \dfrac{-x^2 - 10x - 5}{(x+1)^2(x-1)}, x \neq -1, x \neq 1$

Find the values of the constants D, E and F such that $g(x) = \dfrac{D}{x+1} + \dfrac{E}{(x+1)^2} + \dfrac{F}{x-1}$ **(4 marks)**

$$-x^2 - 10x - 5 \equiv D(x+1)(x-1) + E(x-1) + F(x+1)^2$$

$x = 1$

$$-1^2 - 10(1) - 5 = F(1+1)^2$$

$$-16 = 4F$$

$$\frac{-16}{4} = F$$

$$F = -4$$

$x = -1$

$$-(-1)^2 - 10(-1) - 5 = E(-1-1)$$
$$-1 + 10 - 5 = -2E$$
$$4 = -2E$$
$$\frac{4}{-2} = E \qquad E = -2$$

coeff of x^2

$$-1 = D + E$$
$$-1 = D - 4$$
$$-1 + 4 = D \qquad D = 3$$

(E) **4** Show that $\dfrac{5x^2 - 2x - 1}{x^3 - x^2}$ can be written in the form $\dfrac{C}{x} + \dfrac{D}{x^2} + \dfrac{E}{x-1}$ where C, D and E are constants to be found. **(4 marks)**

$$\frac{5x^2 - 2x - 1}{x^2(x-1)} \equiv \frac{C}{x} + \frac{D}{x^2} + \frac{E}{x-1}$$

$$5x^2 - 2x - 1 \equiv Cx(x-1) + D(x-1) + Ex^2$$

$x = 0$

$$-1 = D(0-1)$$

$$-1 = -D \qquad D = 1$$

$x = 1$

$$5(1)^2 - 2(1) - 1 = E(1)^2$$

$$2 = E \qquad E = 2$$

coeff of x^2

$$5 = C + E$$

$$5 = C + 2$$

$$5 - 2 = C \qquad C = 3$$
