Equating the co-efficient of various powers of $x$ on both sides, we get

On equating the co-efficient of $x^5$

$$2ax^5 = 6x^5$$

$$2a\cancel{x^5} = 6\cancel{x^5}$$

$$a = \frac{6}{2}$$

$$a = 3$$

On equating the co-efficient of $x^4$

$$a - 2b = 1$$

Substituting $a = 3$, we get

$$3 - 2b = 1$$

$$-2b = 1 - 3$$

$$-b = \frac{-2}{-2}$$

$$\cancel{-}b = \cancel{-}1$$

$$b = 1$$

On equating the co-efficient of $x^3$

$$3a - b + 2c = 4$$

Substituting $a = 3$ and $b = 1$, we get

$$3 \times 3 - 1 + 2c = 4$$

$$9 - 1 + 2c = 4$$

$$8 + 2c = 4$$

$$2c = 4 - 8$$

$$2c = -4$$

$$c = \frac{-4}{2}$$

$$c = -2$$

On equating the co-efficient of $x^2$

$$c - 3b - 2d = 5$$

Substituting $c = -2, b = 1$, we get

$$-2 - 3 \times 1 - 2d = 5$$

$$-2 - 3 - 2d = 5$$

$$-5 - 2d = 5$$

$$-2d = 5 + 5$$

$$-2d = 10$$

$$d = \frac{10}{-2}$$

$$d = -5$$

On equating the co-efficient of $x$

$$-3c + d - p = 1$$

Substituting $c = -2$ and $d = -5$, we get

$$-3 \times -2 - 5 - p = 1$$

$$6 - 5 - p = 1$$

$$1 - p = 1$$

$$-p = 1 - 1$$

$-p = 0$

$0 = p$

On equating constant term

$3d + q = -15$

Substituting $d = -5$, we get

$3 \times -5 + q = -15$

$-15 + q = -15$

$q = -15 + 15$

$q = 0$

Therefore, Quotient $q(x) = ax^3 + bx^2 + cx + d$

$= 3x^3 + 1x^2 - 2x - 5$

Remainder $r(x) = px + q$

$= 0x + 0$

$= 0$

Clearly, $r(x) = 0$

Hence, $g(x)$ is a factor of $f(x)$.

********** END **********