

The cubic polynomial $3x^3 + ax^2 + bx - 12$ has a factor $(x - 2)$ and leaves a remainder of -20 when divided by $(x - 1)$. Find the value of a and the value of b .

$$\text{Let } f(x) = 3x^3 + ax^2 + bx - 12$$

$(x - 2)$ is a factor

$$f(2) = 0$$

$$f(2) = 3(2)^3 + a(2)^2 + b(2) - 12 = 0$$

$$3 \times 8 + a \times 4 + 2b - 12 = 0$$

$$4a + 2b = -12$$

$$2a + b = -6$$

Remainder of -20 when divided by $(x - 1)$

$$f(1) = -20$$

$$f(1) = 3(1)^3 + a(1)^2 + b(1) - 12 = -20$$

$$3 + a + b - 12 = -20$$

$$a + b = -11$$

$$2a + b = -6$$

$$a + b = -11$$

$$a = 5$$

$$b = -16$$