Exercise 2.3

Question 20:

If $x + 2a$ is a factor of $x^5 - 4a^2x^3 + 2x + 2a + 3$, find a.

Answer 20:

We have $p(x) = x^5 - 4a^2x^3 + 2x + 2a + 3, \quad g(x) = x + 2a$

Put $g(x) = 0$

$\Rightarrow x + 2a = 0$

$\Rightarrow x = -2a$

According to factor theorem if $g(x)$ is a factor of $p(x)$, the remainder $p(-2a)$ should be zero.

Remainder $= p(-2a) = 0$

$\Rightarrow (-2a)^5 - 4a^2(-2a)^3 + 2(-2a) + 2a + 3 = 0$

$\Rightarrow -32a^5 + 32a^2a^3 - 4a + 2a + 3 = 0$

$\Rightarrow -32a^5 + 32a^5 - 2a + 3 = 0$

$\Rightarrow -2a + 3 = 0$

$\Rightarrow -2a = -3$

$\Rightarrow a = \frac{3}{2}$