

Check-in Quiz Section 3.2-3.3:
Remainder & Factor Theorem and Fully Factoring Polynomials

Complete the following questions SHOWING ALL WORK and steps where applicable.

1. Determine the remainder when $P(x) = -x^3 - 2x^2 + 4x + 1$ is divided by $x + 2$ 1 mark

$$\begin{aligned}
 P(-2) &= -(-2)^3 - 2(-2)^2 + 4(-2) + 1 \\
 &= -(-8) - 2(4) - 8 + 1 \\
 &= 8 - 8 - 8 + 1 \\
 R &= \boxed{-7}
 \end{aligned}$$

2. Solve for k in the following if the remainder is -30 : 1 mark

$$\begin{aligned}
 &(-x^4 + kx^2 - 2x - 9) \div (x+3) \\
 &\quad \downarrow \\
 &P(-3) = -30 \\
 &-(-3)^4 + k(-3)^2 - 2(-3) - 9 = -30 \\
 &-81 + 9k + 6 - 9 = -30 \\
 &9k - 84 = -30 \\
 &\quad \downarrow \\
 &9k = 54 \\
 &\quad \downarrow \\
 &\boxed{k = 6}
 \end{aligned}$$

3. Fully factor the following polynomial equation:

$$2x^3 - 7x^2 + 9$$

a) List all possible factors using Integral Zero Theorem:

0.5 marks

$$\pm 1, \pm 3, \pm 9$$

b) Test to determine the binomial factor(s) you will use for division and write the factor(s) in $(x-a)$ form:

$$\begin{aligned}
 P(1) &= 2(1)^3 - 7(1)^2 + 9 & P(-1) &= 2(-1)^3 - 7(-1)^2 + 9 & 0.5 \text{ marks} \\
 &= 2 - 7 + 9 & &= -2 - 7 + 9 \\
 &= 3 & &= 0 \checkmark \\
 & \downarrow & & \downarrow \\
 & (x+1) & &
 \end{aligned}$$

c) Fully factor the polynomial: (*synthetic division and quadratic factoring*)

2 marks

$$\begin{array}{c|ccccc}
 x+1 & 2x^3 & -7x^2 & 0x & +9 \\
 \hline
 1 & 2 & -7 & 0 & 9 \\
 - & \downarrow & 2 & -9 & 9 \\
 \hline
 x & 2 & -9 & 9 & 0 \checkmark \\
 & 2x^2 & -9x & +9
 \end{array}$$

$$\begin{aligned}
 AC &= 18 & (2x-3)(2x-\frac{6}{2}) \\
 -3, -6 &= -9 & (2x-3)(x-3)
 \end{aligned}$$

d) Final answer (fully factored form):

0.5 marks

$$(x+1)(x-3)(2x-3)$$

e) Write the solutions (zeros, roots, x-intercepts):

0.5 marks

$$x = -1, 3, \frac{3}{2}$$