



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:

0.5 marks

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

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

2 marks

$x+1$	$2x^3 - 7x^2 + 0x + 9$
1	2    -7    0    9
-	↓    2    -9    9
x	2    -9    9    0 ✓
	$2x^2 - 9x + 9$

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

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

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