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VCE Mathematical Methods ½

Polynomials [1.5]

Test

19 Marks. 20 Minutes Writing. 1 Minute Reading.

Results:

Test Questions	_____ / 19

Section A: Test Questions (19 Marks)

Question 1 (4 marks)

Tick whether the following statements are **True** or **False**.

Statement	True	False
a. The minimum number of roots for a cubic is three.		✓
b. The root of a polynomial that has a factor of $x + 3$ is $x = 3$.		✓
c. If $f(1) = 2$, then $f(x) \div (3x - 6)$ has a remainder of 2.		✓
d. The remainder of $(x^3 + 3x^2 - x + 2) \div (x - 2)$ is 20.	✓	
e. To factorise a quartic, we generally need to find two roots by trial and error.	✓	
f. The rational root theorem suggests that $ax^3 + bx^2 + cx + d$ will have roots that are factors of d divided by the factors of a.	✓	
g. Graphs of polynomials where the highest degree is odd, both start and finish at either positive or negative infinity.		✓
h. All repeated roots correspond to turning points on the graph of a polynomial.		✓

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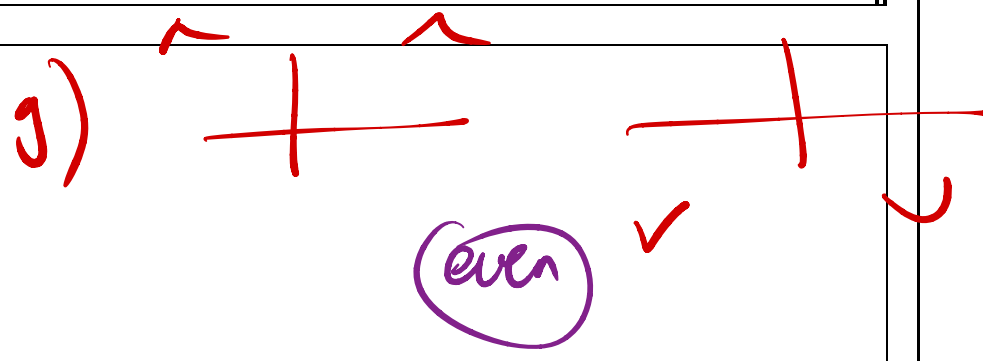

Question 2 (3 marks)

Consider the function $f(x) = x^3 + ax^2 + bx$. If $x - 1$ is a factor of $f(x)$ and the remainder of $f(x) \div (x + 4)$ is given by -20, find the value(s) of a and b.

① $f(1) = 0 \rightarrow 1 + a + b = 0$

$a + b = -1$

② $f(-4) = -20 \rightarrow -64 + 16a - 4b = -20$

$16a - 4b = 44$

$4a - b = 11$

$a + b = -1$

$4a - b = 11$

$5a = 10$

$a = 2, \quad b = -3$

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Question 3 (3 marks)

Solve the following equation for x.

$$2x^3 + 11x^2 = 12(x + 3)$$

$2x^3+11x^2-12x-36=0$

$x=1,\ 2+11-12-36 \neq 0$

$x=-1,\ -2+11+12-36 \neq 0$

$x=2,\ 16+44-24-36=60-60=0 \rightarrow x-2$ is a factor.

$$x-2 \overline{)\ 2x^3+11x^2-12x-36}$$

$2x^2+15x+18$

$-(2x^3-4x^2)$

$15x^2-12x$

$-(15x^2-30x)$

$18x-36$

$-(18x-36)$

0

$(x-2)(2x^2+15x+18)$

$(x-2)(x+6)(2x+3)=0$

$x=-6, -\frac{3}{2}, 2$

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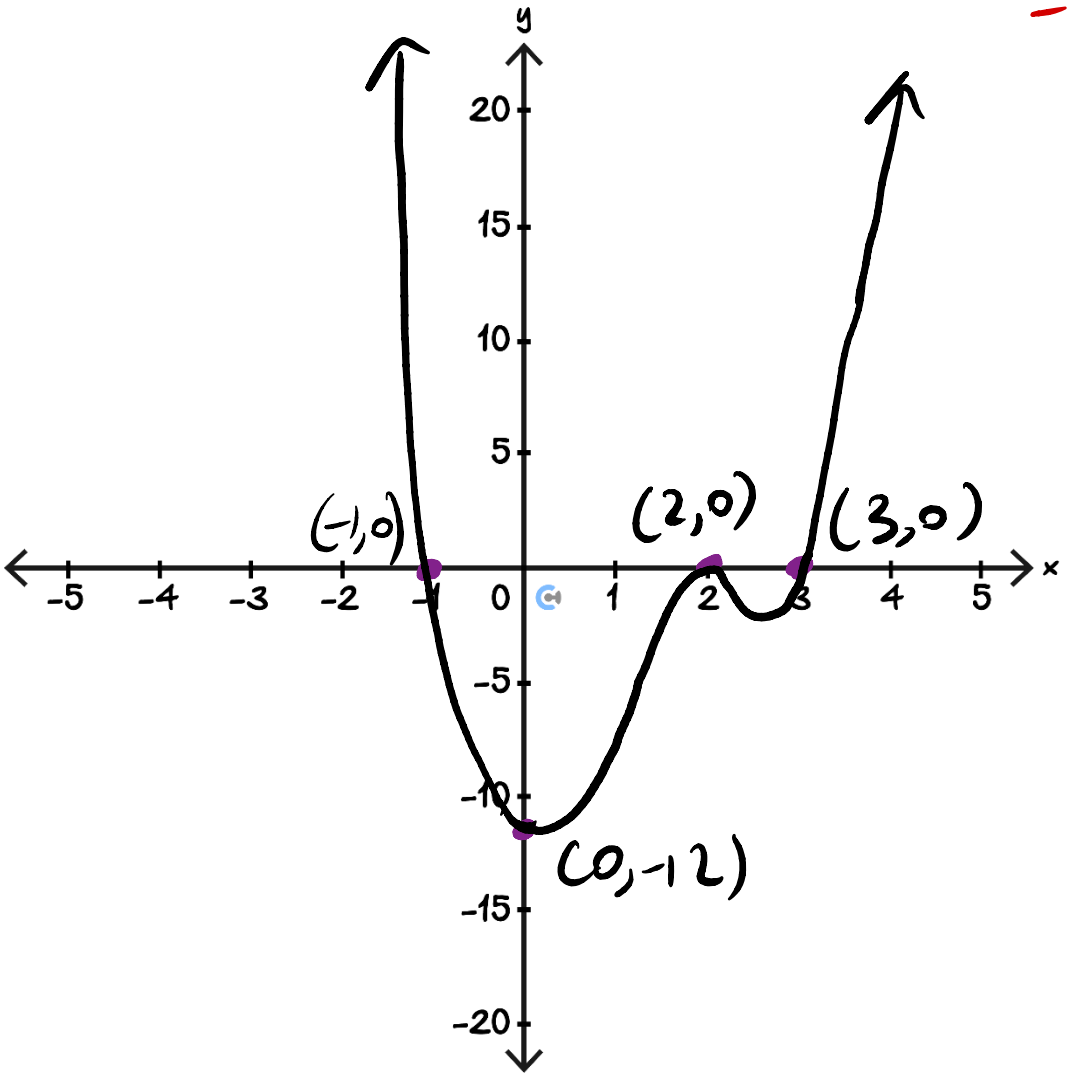
Question 4 (3 marks)

Sketch the graph of the following function on the axes below. Label all axes intercepts with their coordinates.

$$y = (x-2)^2(x-3)(x+1)$$

y-int: $(4)(-3)(1)$
$= -12$
$(0,-12)$



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Question 5 (6 marks)

Consider the function $f(x) = 2x^3 - 5x^2 - ax + 6$.

It is known that the remainder, when $f(x)$ is divided by $x - 3$, is 12.

a. Show that $a = 1$. (1 mark)

- $f(3) = 12$

$\therefore 2(3)^3 - 5(3)^2 - 3a + 6 = 12$

$54 - 45 - 3a + 6 = 12$

$15 - 3a = 12$

$3a = 3$

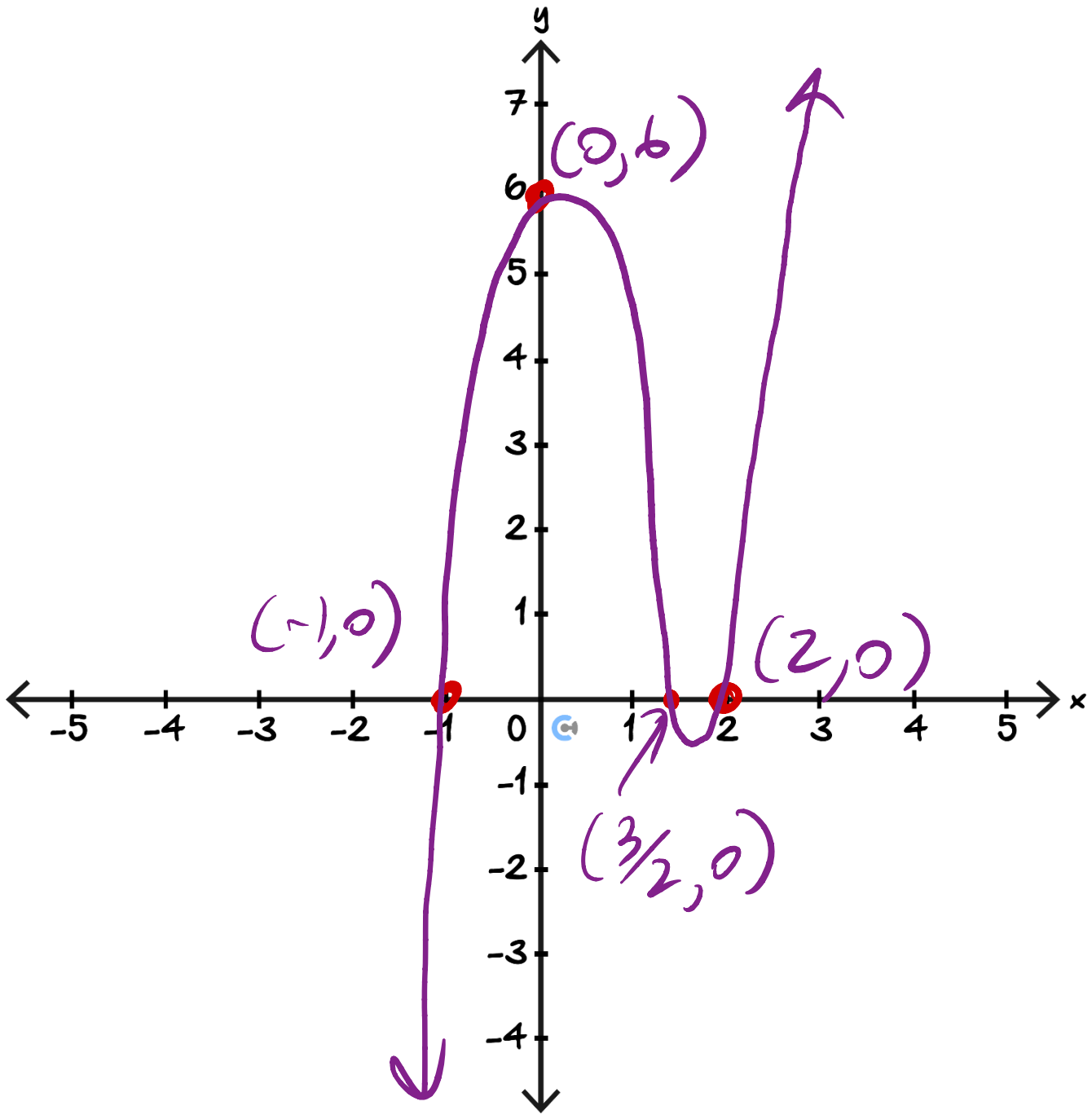
$a = 1$ as req.

b. Hence, solve $f(x) = 0$. (3 marks)

$f(x) = 2x^3 - 5x^2 - x + 6$

$x = -1, 3/2, 2$

c. Sketch the graph of $y = f(x)$ on the axes below. Label all axis intercepts with coordinates. (2 marks)



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

y-int: $(1)(-2)(-3) = 6$

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VCE Mathematical Methods ½

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