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VCE Mathematical Methods ¾

Polynomials [1.7]

Test Solutions

20 Marks. 1 Minute Reading. 22 Minutes Writing

Results:

Test Questions	_____ / 17
Extension Test Question	_____ / 3

Section A: Test Questions (17 Marks)

Question 1 (5 marks)

Tick whether the following statements are true or false.

	True	False
a. A root which corresponds to a polynomial with a factor of $x + 4$ is 4. (0.5 marks)		✓
b. If $f(2) = 4$, then $f(x) \div (2x - 4)$ has a remainder of 4. (0.5 marks)		✓
c. The remainder of $(x^3 + x^2 - x + 1) \div (x + 1)$ is 2. (0.5 marks)	✓	
d. To factorise a quartic, we must first find two roots by trial and error. (0.5 marks)	✓	
e. 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. (0.5 marks)	✓	
f. All odd functions must have odd powers for power functions. (0.5 marks)	✓	
g. Even functions are always symmetrical around the x-axis. (0.5 marks)		✓
h. The maximal domain of $f(x) = x^{\frac{3}{2}}$ is given by $[0, \infty)$. (0.5 marks)	✓	
i. $f(x) = x^{\frac{2}{3}}$ is an even function. (0.5 marks)	✓	
j. If $f(-x) = -f(x)$, then it is an even function. (0.5 marks)		✓

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Question 2 (3 marks)

Consider the function $f(x) = x^3 + ax^2 + bx$. If $x - 2$ is a factor of $f(x)$ and the remainder of $f(x) \div (x - 3)$ is given by 12, find the value(s) of a and b.

$a = -1, b = -2$

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Question 3 (3 marks)

Solve the following equation for x.

$$2x^3 - 5x^2 - 28x + 13 = -2$$

$x = -3$

$x = \frac{1}{2}$

$x = 5$

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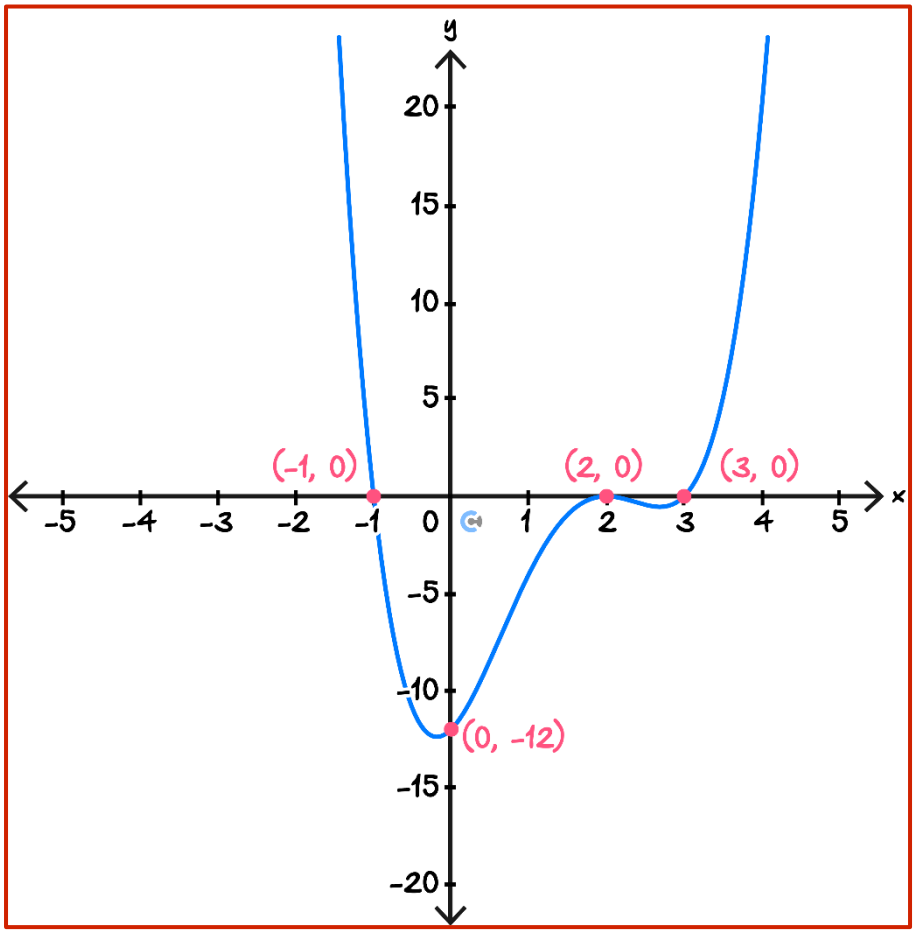
Question 4 (3 marks)

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

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



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Question 5 (3 marks)

It is known that $f(x)$ is an even function where $f(-2) = 4$ and $f'(-2) = 3$.

Let $g(x) = f(x) + 2$.

Find the values of $g(2)$ and $g'(2)$.

$g(2) = f(2) + 2 = 6$

$g'(2) = f'(2) = -3$

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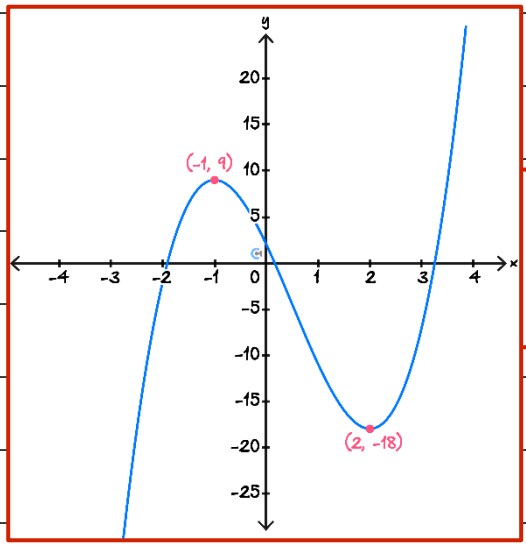
Section B: Extension Test Question (3 Marks)

Question 6 (3 marks)

Consider $f(x) = 2x^3 - 3x^2 - 12x + 2$.

Given that the turning point occurs at $x = -1$ and $x = 2$, find the value(s) of k such that $f(x) + k = 0$ has 3 solutions.



From the graph, the turning points of $f(x)$ at $(-1,9)$ and $(2,-18)$.

$\therefore k \in (-9,18)$

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