

Function By Topic

1. HKDSE MATH CORE 2012 Past Paper I Q13

- (a) Find the value of k such that $x - 2$ is a factor of $kx^3 - 21x^2 + 24x - 4$.
(2 marks)
- (b) Figure 4 shows the graph of $y = 15x^2 - 63x + 72$. Q is a variable point on the graph in the first quadrant. P and R are the feet of the perpendiculars from Q to the x -axis and the y -axis respectively.

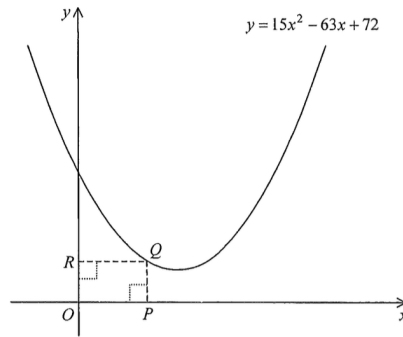


Figure 4

- (i) Let $(m, 0)$ be the coordinates of P . Express the area of the rectangle $OPQR$ in terms of m .
- (ii) Are there three different positions of Q such that the area of the rectangle $OPQR$ is 12? Explain your answer.

(5 marks)

2. HKDSE MATH CORE 2013 Past Paper I Q12

Let $f(x) = 3x^3 - 7x^2 + kx - 8$, where k is a constant. It is given that $f(x) \equiv (x - 2)(ax^2 + bx + c)$, where a , b and c are constants.

- (a) Find a , b and c .

(4 marks)

- (b) Someone claims that all the roots of the equation $f(x) = 0$ are real numbers. Do you agree?

Explain your answer.

(3 marks)

3. HKDSE MATH CORE 2014 Past Paper I Q13

It is given that $f(x)$ is the sum of two parts, one part varies as x^2 and the other part is a constant. Suppose that $f(2) = 59$ and $f(7) = -121$.

(a) Find $f(6)$.

(4 marks)

(b) $A(6, a)$ and $B(-6, b)$ are points lying on the graph of $y = f(x)$. Find the area of $\triangle ABC$, where C is a point lying on the x -axis.

(4 marks)

4. HKDSE MATH CORE 2015 Past Paper I Q11

Let $f(x) = (x - 2)^2(x + h) + k$, where h and k are constants. When $f(x)$ is divided by $x - 2$, the remainder is 5. It is given that $f(x)$ is divisible by $x - 3$.

(a) Find h and k .

(3 marks)

(b) Someone claims that all the roots of the equation $f(x) = 0$ are integers. Do you agree?

Explain your answer.

(3 marks)

5. HKDSE MATH CORE 2016 Past Paper I Q14

Let $p(x) = 6x^4 + 7x^3 + ax^2 + bx + c$, where a , b and c are constants. When $p(x)$ is divided by $x + 2$ and when $p(x)$ is divided by $x - 2$, the two remainders are equal. It is given that $p(x) = (lx^2 + 5x + 8)(2x^2 + mx + n)$, where l , m and n are constants.

(a) Find l , m and n .

(5 marks)

(b) How many real roots does the equation $p(x) = 0$ have? Explain your answer.

(5 marks)

6. HKDSE MATH CORE 2017 Past Paper I Q14

Let $f(x) = 6x^3 - 13x^2 - 46x + 34$. When $f(x)$ is divided by $2x^2 + ax + 4$, the quotient and the remainder are $3x + 7$ and $bx + c$ respectively, where a , b and c are constants.

(a) Find a .

(3 marks)

(b) Let $g(x)$ be a quadratic polynomial such that when $g(x)$ is divided by $2x^2 + ax + 4$, the remainder is $bx + c$.

(i) Prove that $f(x) - g(x)$ is divisible by $2x^2 + ax + 4$.

(ii) Someone claims that all the roots of the equation $f(x) - g(x) = 0$ are integers. Do you agree? Explain your answer.

(5 marks)

7. HKDSE MATH CORE 2018 Past Paper I Q12

Let $f(x) = 4x(x + 1)^2 + ax + b$, where a and b are constants. It is given that $x - 3$ is a factor of $f(x)$. When $f(x)$ is divided by $x + 2$, the remainder is $2b + 165$.

(a) Find a and b .

(3 marks)

(b) Someone claims that the equation $f(x) = 0$ has at least one irrational root. Do you agree?

Explain your answer.

(4 marks)

8. HKDSE MATH CORE 2019 Past Paper I Q11

Let $p(X)$ be a cubic polynomial. When $p(x)$ is divided by $x - 1$, the remainder is 50. When $p(X)$ is divided by $x + 2$, the remainder is -52 . It is given that $p(x)$ is divisible by $2x^2 + 9x + 14$.

- (a) Find the quotient when $p(X)$ is divided by $2x^2 + 9x + 14$.
(3 marks)
- (b) How many rational roots does the equation have? Explain your answer.
(3 marks)

9. HKDSE MATH CORE 2020 Past Paper I Q13

The cubic polynomial $f(x)$ is divisible by $x - 1$. When $f(x)$ is divided by $x^2 - 1$, the remainder is $kx + 8$, where k is a constant.

(a) Find k .

(3 marks)

(b) It is given that $x + 3$ is a factor of $f(x)$. When $f(x)$ is divided by x , the remainder is 24.

Someone claims that all the roots of the equation $f(x) = 0$ are integers. Is the claim correct?

Explain your answer.

(5 marks)

10. **HKDSE MATH CORE 2021 Past Paper I Q12**

The polynomial $p(x)$ is divisible by $x - 5$. When $p(x)$ is divided by $x^2 + x + 1$, the quotient and the remainder are $2x^2 - 37$ and $cx + c - 1$ respectively, where c is a constant.

(a) Find c .

(3 marks)

(b) Prove that $x + 3$ is a factor of $p(x)$.

(1 marks)

(c) Someone claims that all the roots of the equation $p(x) = 0$ are real numbers. Is the claim correct? Explain your answer.

(3 marks)

11. HKDSE MATH CORE 2022 Past Paper I Q12

The equation of the circle C is $x^2 + y^2 - 154x - 128y + 224 = 0$. Denote the centre of C by G . The coordinates of the point H are $(65, 48)$.

- (a) Find the distance between G and H .

(3 marks)

- (b) Let P be a moving point on C . When the area of $\triangle GHP$ is the greatest,

(i) describe the geometric relationship between GH and GP ;

(ii) find the perimeter of $\triangle GHP$.

(4 marks)

12. HKDSE MATH CORE 2023 Past Paper I Q13

Define $g(x) = x^3 + 5x^2 - 12x - 1$. Let $h(x) = 3x^4 + ax^3 - 16x^2 + bx + c$, where a , b and c are constants. When $h(x)$ is divided by $g(x)$, the quotient and the remainder are equal.

- (a) Find the quotient when $h(x)$ is divided by $g(x)$.

(3 marks)

- (b) How many rational roots does the equation $h(x) = 0$ have? Explain your answer.

(4 marks)