

Non-Calculator

Q1.

$$(3x + 1)(x - 2) + ax + b \equiv 3x^2 + 8x - 5$$

Work out the values of a and b .

a

=

(Total 4 marks)

...

b

=

Q2.

Write $x^2 + 8x + 7$ in the form $(x + a)^2 + b$

...

Answer _____

(Total 3 marks)

Q3.

$$f(x) = 2x^2$$

$$g(x) = x + 5$$

Circle the composite function

$fg(x)$

$$2x^2 + 5$$

$$2(x + 5)^2$$

$$2(x^2 + 5)$$

$$4(x + 5)^2$$

(Total 1 mark)

Q4.

The sum of the squares of two consecutive integers is one greater than twice the product of the integers.

For example $9^2 + 10^2 = 81 + 100$ and $2 \times 9 \times 10 = 180$

$$= 181$$

Prove this result algebraically.

(Total 5 marks)

Q5.

n is an integer.

Show that $\frac{n(n-1)}{2} + \frac{n(n+1)}{2}$ is a square number.

(Total 3 marks)

Q6.

(a) Expand and simplify $(2x + 1)(3x - 4)$

Answer _____

(2)

(b) Factorise $6x^2 - 23x - 4$

Answer _____

(2)

(Total 4 marks)

Q7.

$f(x) = 2x + c$ $g(x) = cx + 5$ $fg(x) = 6x + d$ c and d are constants.

Work out the value of d .

Answer _____

(Total 3 marks)

Q8.

Expand and simplify $(y^2 - 5y + 2)(2y - 3)$

Answer _____

(Total 3 marks)

Q9.

Expand and simplify $(x - 4)(2x + 3y)^2$

Answer _____

(Total 4 marks)

Q10.

$$(3x - 1)(ax + b) \equiv 12x^2 - 19x + c$$

Work out the values of a , b and c .

$a =$ _____ $b =$ _____ $c =$ _____

(Total 4 marks)

Q11.

Factorise $9a^2 - b^2$

Answer _____

(Total 2 marks)

Calculator

Q12.

(a) Factorise fully $9y^3 - 6y$

Answer _____

(2)

(b) Factorise $3x^2 - 22x + 7$

Answer _____

(2)

(Total 4 marks)

Q13.

Expand and simplify $(t + 4)^3$

Answer _____

(Total 3 marks)

Q14.

Prove that $x^2 + x + 1$ is always positive.

(Total 3 marks)

Q15.

For all values of x , $f(x) = x^2 + 1$ $g(x) = x - 5$

(a) Show that $fg(x) = x^2 - 10x + 26$

(2)

(b) Solve $fg(x) = gf(x)$

$x =$ _____

(4)

(Total 6 marks)

Q18.

$$a^2 - b^2 \equiv (a + b)(a - b)$$

a and b are positive whole numbers with $a > b$

$a^2 - b^2$ is a prime number.

Why are a and b consecutive numbers?

(Total 2 marks)

Q19.

(a) Factorise fully $3x^2 - 12$

Answer _____

(2)

(b) Factorise $5x^2 + 4xy - 12y^2$

Answer _____

(3)

(Total 5 marks)

Q20.

(a) Factorise fully $5m^2 - 20p^2$

Answer _____

(3)

(b) You are given that $p = 15$ and $5m^2 - 20p^2 = 0$

Using your answer to part (a), or otherwise, work out the values of m .

Answer _____

(2)

(Total 5 marks)

Q21.

$$f(x) = 3x$$

Circle the expression for $f^{-1}(x)$

$-3x$ $\frac{3}{x}$ $\frac{1}{3x}$ $\frac{x}{3}$

(Total 1 mark)

Q22.

Prove that $(5n + 3)(n - 1) + n(n + 2)$
is a multiple of 3 for all integer values of n .

(Total 4 marks)

Q23.

Factorise $3x^2 + 14x + 8$

Answer _____

(Total 2 marks)

Q24.

w , x and y are three integers.

w is 2 less than x

y is 2 more than x

Prove that $wy + 4 = x^2$

(Total 3 marks)