5.2 Applications of Differentiation: Gradients, Tangents and Turning Points: 30-minute Pack

AQA 8365 · Calculator allowed · about 30 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A curve has equation $y = x^2 + 9x - 2$. At the point P on the curve, the tangent is parallel to the line $y = 3x + 5$. Find the coordinates of P.

(Total for Question 1 is 4 marks)

---

2 A curve has equation $y = 2x^2 + 16x + 42$. Find the coordinates of the turning point of the curve and state whether it is a maximum or a minimum.

(Total for Question 2 is 4 marks)

© Revision Library | revisionlibrary.co.uk

3 A curve has equation $y = x^2 - 6x + 10$.

(a) Find dy/dx. **(1)**

(b) Find the coordinates of the turning point of the curve, and state whether it is a maximum or a minimum point. **(3)**

(Total for Question 3 is 4 marks)

---

4 A curve C has equation $y = 2x^3 - 3x^2 - 12x + 5$. Show that $x = 2$ is a stationary point of C.

(Total for Question 4 is 3 marks)

---

5 A curve has equation $y = x^2 + 6x - 2$. Find the gradient function dy/dx.

(Total for Question 5 is 1 mark)

---

6 State, without further calculation, whether the curve $y = x^2 - 12x + 40$ has a minimum or a maximum turning point.

(Total for Question 6 is 1 mark)

© Revision Library | revisionlibrary.co.uk

7 A gardener has 60 metres of edging to enclose a rectangular flower bed on all four sides. Let x metres be the width of the flower bed and A m^2 be the area enclosed.

(a) Show that $A = 30x - x^2$. **(2)**

(b) Find dA/dx. **(1)**

(c) Find the value of x that gives the maximum area, and calculate this maximum area. **(4)**

(Total for Question 7 is 7 marks)

8 A curve has equation $y = x^3 - 3x^2$. Calculate the gradient of the curve at the point where $x = 1$.

(Total for Question 8 is 2 marks)

© Revision Library | revisionlibrary.co.uk

Mark scheme · 5.2 Applications of Differentiation: Gradients, Tangents and Turning Points: 30-minute Pack

Question 1

differentiates: dy/dx = 2x + 9 **M1**

sets dy/dx equal to the gradient 3 **M1**

x = -3 **A1**

(-3, -20) cao **A1**

Answer: (-3, -20)

Question 2

differentiates and sets equal to 0 **M1**

x = -4 **A1**

y = 10 **A1**

minimum **B1**

Answer: (-4, 10) minimum

Question 3

(a) dy/dx = 2x - 6 cao **B1**

(a) Answer: dy/dx = 2x - 6

(b) sets their dy/dx = 0 and solves for x, ft from part (a) **M1**

(b) turning point (3, 1) **A1**

(b) minimum, since the coefficient of x^2 is positive (the curve is u-shaped) oe **A1**

(b) Answer: (3, 1), a minimum point

Question 4

differentiates correctly to obtain dy/dx = $6x^2$ - 6x - 12 **M1**

substitutes x = 2 into dy/dx **M1**

dy/dx = 0 at x = 2, so x = 2 is a stationary point, fully shown cso **A1**

Answer: dy/dx = 0 at x = 2 (shown)

Question 5

dy/dx = 2x + 6 cao **B1**

Answer: dy/dx = 2x + 6

Question 6

minimum, since the coefficient of x^2 is positive **B1**

Answer: Minimum

Question 7

(a) uses the perimeter 2x + 2y = 60 to express the length as y = 30 - x, and multiplies by x **M1**

(a) A = 30x - x^2 fully shown cso **A1**

(a) Answer: A = 30x - x^2 (shown)

(b) dA/dx = 30 - 2x cao, ft from part (a) **B1**

(b) Answer: dA/dx = 30 - 2x

(c) sets their dA/dx = 0 and solves for x, ft from part (b) **M1**

(c) x = 15 **A1**

(c) substitutes x = 15 back into A = 30x - x^2, dependent on previous M1 (dM1) **M1**

(c) maximum area = 225 m² **A1**

(c) Answer: x = 15 m, maximum area = 225 m^2

Question 8

differentiates to obtain dy/dx = $3x^2$ - 6x and substitutes x = 1 **M1**

gradient = -3 cao **A1**

Answer: gradient = -3

© Revision Library | revisionlibrary.co.uk