TEST

Answer all of these questions. Remember to show your working out in all questions.

MAIN QUESTIONS

1.

Differentiate $y = 3x^2 + 2x - 5$

> $dy/dx = 6x + 2$

2.

Find the derivative of $f(x) = 4x^3 - 2x^2 + x$

> $f'(x) = 12x^2 - 4x + 1$

3.

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

> $dy/dx = 4x - 5$

4.

Find $f'(x)$ when $f(x) = \sqrt{x} + 1/x$

> $f'(x) = 1/(2\sqrt{x}) - 1/x^2$

5.

Differentiate $y = \sin(2x) + \cos(3x)$

> $dy/dx = 2\cos(2x) - 3\sin(3x)$

6.

Find the derivative of $f(x) = e^{(3x)} + \ln(2x)$

> $f'(x) = 3e^{(3x)} + 1/x$

7.

Differentiate $y = x^2e^x$

> $dy/dx = e^x(x^2 + 2x)$

8.

Find $f'(x)$ when $f(x) = (x^2 + 1)/(x - 2)$

> $f'(x) = (x^2 - 4x - 1)/(x - 2)^2$

9.

Differentiate $y = \tan(3x) + \sec(2x)$

> $dy/dx = 3\sec^2(3x) + 2\sec(2x)\tan(2x)$

10.

Find the derivative of $f(x) = \ln(x^3 + 2x)$

> $f'(x) = (3x^2 + 2)/(x^3 + 2x)$

MASTER QUESTIONS

M1.

A ball is thrown vertically upwards with its height given by $h(t) = 20t - 5t^2$ metres. Find the maximum height reached and when it occurs.

> Maximum height of 20 metres occurs after 2 seconds

M2.

The volume of a sphere is increasing at a rate of 10 cm^3/s. Find the rate of increase of the radius when the radius is 5 cm.

dr/dt = 1/(10π) cm/s

M3.

A rectangular field is to be enclosed with 100 metres of fencing, with one side against a river (needing no fence). Find the dimensions that maximise the area.

The field should be 25m by 50m

M4.

The cost C of producing x items is given by $C(x) = 0.01x^2 + 20x + 1000$. Find the number of items that minimises the average cost per item.

316 items minimise the average cost

M5.

A particle moves along a straight line with position $s(t) = t^3 - 6t^2 + 9t$ metres. Find when the particle is at rest and determine if these are points of maximum or minimum velocity.

The particle is at rest at t = 1s (maximum) and t = 3s (minimum)