

SCORE

/100

NAME:.....

1. Find $\frac{dy}{dx}$

(i) $y = \sqrt{x}e^x$

(ii) $y = \frac{x}{\sqrt{9-4x}}$

(iii) $y = (x+2)^8(x+3)^6$

(iv) $y = (x^2 - 7x + 11)^7$

(v) $y = e^{3x^2+2x-5}$

(vi) $y = \sqrt[5]{1+5x^3}$

(vii) $y = \cos(5x^2 + 1)$

(viii) $y = e^{\sin x}$

2. Find an equation of the tangent line to the given curve at the given point:

(i) $y = x + \frac{4}{x}$ at the point $(2, 4)$

(ii) $y = x^2 + 2e^x$ at the point $(0, 2)$

(iii) $y = \frac{\sqrt{x}}{x+1}$ at the point $(4, 0.4)$

3. A particle moves on a vertical line according to the law of motion:

$$y = f(t) = t^3 - 12t + 3, \quad t \geq 0$$

where t is measured in seconds and s in meters.

(i) Find the velocity and acceleration at time t

(ii) When is the particle moving upward and when is it moving downward?

(iii) When is the particle at rest?

(iv) Find the distance that the particle travels in the time interval $0 \leq t \leq 3$.

(v) When is the particle speeding up and when is it slowing down?

4. (*bonus question*) Find $\frac{dy}{dx}$ by implicit differentiation:

(i) $x^2y^3 + 3y^2 = x - 4y$

(ii) $x \sin y + \cos 2y = \cos y$

(iii) Find the points on the ellipse $x^2 + 2y^2 = 1$ where the tangent has slope 1.