

Name:	A#:
-------	-----

1. Consider the function $f(x) = 5\sqrt{3x} - 2$.

(a) Use the **limit definition** to find the derivative $f'(x)$.

(b) Find the equation of the tangent line to the curve $y = f(x)$ at $x = 3$.

2. Find $\frac{dy}{dx}$. **Do not** simplify your answers.

(a) $y = 3x^4 - \frac{2}{\sqrt[3]{x}} + 2^x + \frac{7}{5x^2} + 5 \tan x + 4e^3 + \frac{x^2 + 1}{2}$

(b) $y = (2 + 3x^2)^4 e^{\sqrt{x}+1}$

(c) $y = \cos^3(5x) + \sec^3(x^5)$

(d) $y = \left(\frac{\sin 2x}{1 + \sqrt{1 + e^{x^2}}} \right)^6$

3. Point P lies somewhere on a straight line that runs east to west. A particle travels along this line, beginning at time $t = 0$, such that its displacement from a fixed point P at time $t \geq 0$ is given by the formula

$$d(t) = \frac{t^2 + t + 7}{t^2 + 8}.$$

(Positive values of $d(t)$ indicate positions to the *east* of P . Time is measured in seconds and distance in metres.)

- (a) Find the average velocity of the particle in the first 2 seconds of travel.

- (b) What is the instantaneous velocity of the particle at time $t = 2$?

- (c) At what time(s) t is the particle stationary (i.e. has velocity 0)?

- (d) What is the total distance traveled by the particle in the first 10 seconds?