

AP Calculus In-Class Three – Differentiation
2.1 Definition of Derivative; 2.2 Differentiation Rules

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

(a) $y = \frac{2-x}{3x+1}$

(b) $y = 2\sqrt{x} - \frac{1}{2\sqrt{x}}$

(c) $y = \sqrt{x^2 + 2x - 1}$

(d) $y = \frac{e^x - e^{-x}}{e^x + e^{-x}}$

(e) $y = \ln(\sqrt{x^2 + 1})$

(f) $y = \frac{1}{2 \sin 2x}$

(g) $y = x \ln^3 x$

(h) $y = \frac{1+x^2}{1-x^2}$

(i) $y = x^{x^x}$

2. Find limits.

(a) $\lim_{h \rightarrow 0} \frac{(1+h)^6 - 1}{h}$

(b) $\lim_{x \rightarrow 0} \frac{\sin 2x}{x}$

(c) $\lim_{x \rightarrow 0} \frac{\sec x - \cos x}{x^2}$

3. The table below shows some points on a function f that is both continuous and differentiable on the closed interval $[2, 10]$.

x	2	4	6	8	10
$f(x)$	30	25	20	25	30

Which must be true?

(A) $f(x) > 0$ for $2 < x < 10$

(B) $f'(6) = 0$

(C) $f'(8) > 0$

(D) The maximum value of f on the interval $[2, 10]$ is 30.

(E) For some value of x on the interval $[2, 10]$ $f'(x) = 0$.

4. Let $f(x) = 3^x - x^3$. Find the x -coordinates of the point where the tangent to the curve is parallel to the secant through $(0, 1)$ and $(3, 0)$.