2012 Summer Math Course for Direct Entry Students,
Computer Science Department, HKUST.

Tutorial 09: Applications of Differentiation

1. Suppose $f(x)$ is a differentiable function with $f(1) = 2$, $f(2) = -2$, $f'(1) = 3$ and $f'(2) = -3$. And suppose $y = f(x)$ is plotted out. Find the equation of the following:

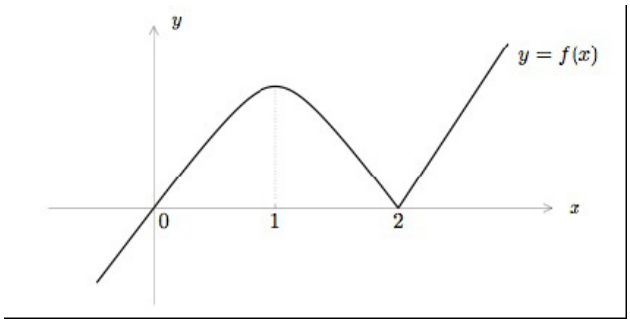
   (a) Tangent at the point (1, 2);

   (b) Tangent at the point (2, -2);

   (c) Normal at the point (1, 2);

   (d) Normal at the point (2, -2).

2. Which of the following is true about the graph of the function $f(x)$?



   (a) $f'(0) < 0$, $f'(1) = 0$ and $f'(2) > 0$

   (b) $f'(0) > 0$, $f''(1) > 0$, and $f'(2)$ does not exist

   (c) $f'(0) > 0$, $f'(1) = 0$, and $f'(2) = 0$

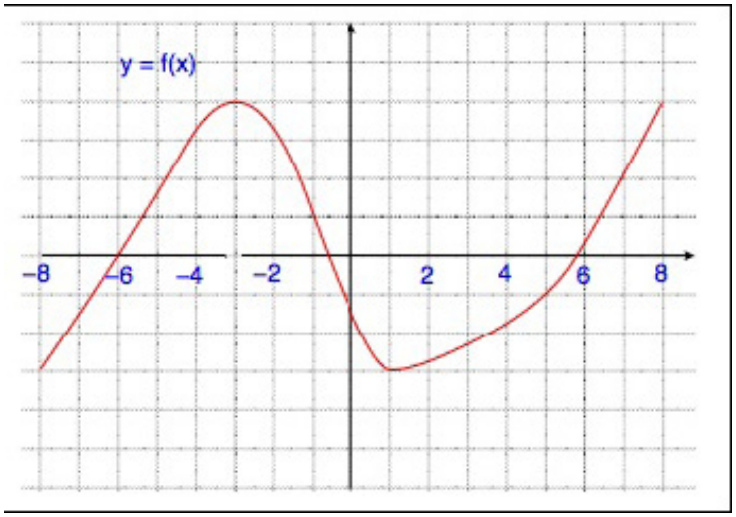
   (d) $f'(0) > 0$, $f''(1) < 0$, and $f'(2)$ does not exist

   (e) $f'(0) > 0$, $f'(1) = 0$, and $f'(2) = \infty$

3. Find the point of inflection of $g(x) = x^2 - \frac{27}{x}, x > 0$.

4. The derivative of the following differentiable function is always negative on the following intervals:

   (a) $-2 < x < 0$



(b) $-8 < x < -6$

(c) $0 < x < 6$

(d) $2 < x < 8$

(e) $6 < x < 8$

5. The lengths of the sides of a square are increasing at a constant rate of 2 ft/min. In terms of the perimeter, P, what is the rate of change of the area of the square in square feet per minute?

(a) P

(b) $-P$

(c) $2P$

(d) $4P$

(e) $8P$