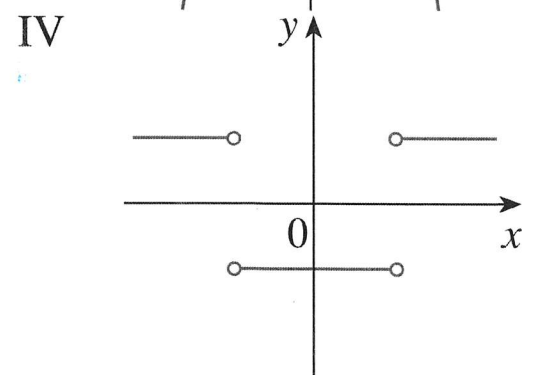
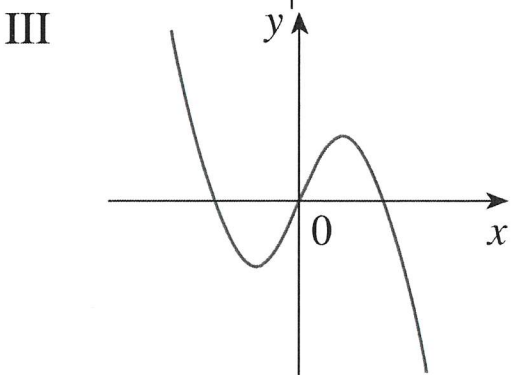
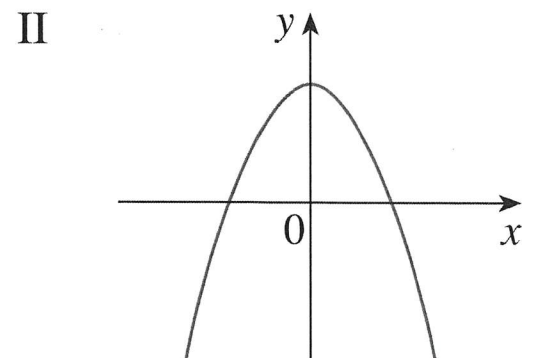
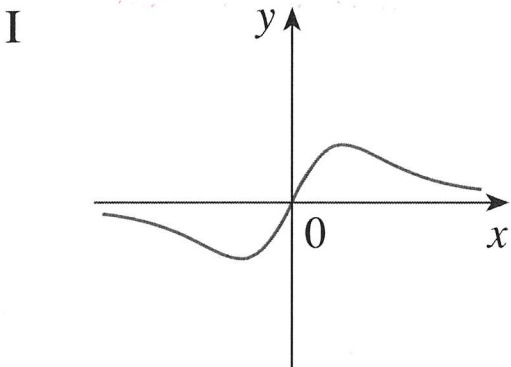
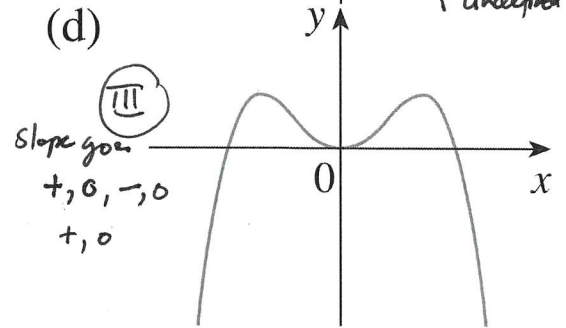
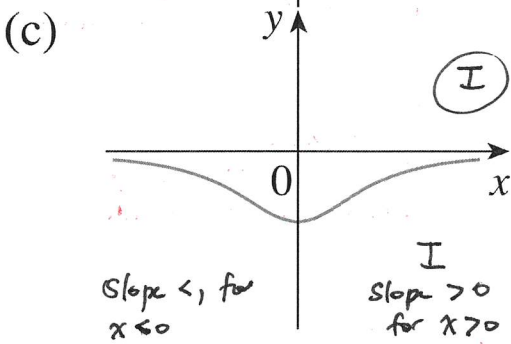
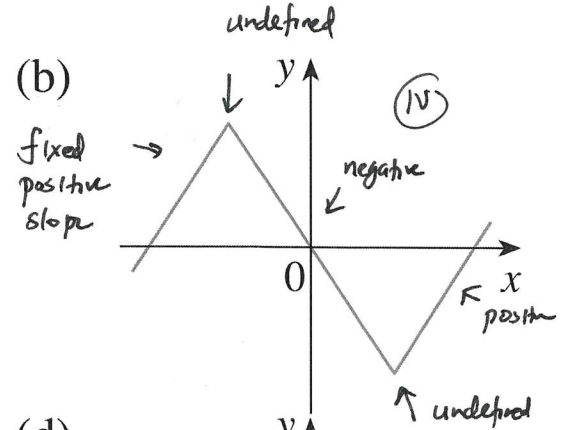
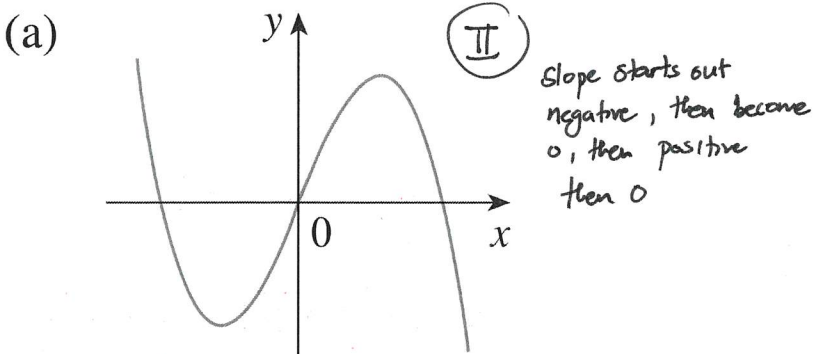


Name:

Sec. 2.8 - The Derivative function

Math 251

1. Match the graph of each function in (a) – (d) with the graph of the derivative I – IV. Give reasons for your choices.



2. Use the definition of the derivative to find the derivative of  $f(x) = \frac{1}{\sqrt{x}}$ . State the domain of  $f(x)$  and the domain of the derivative.

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

$$= \lim_{h \rightarrow 0} \left( \frac{\frac{1}{\sqrt{x+h}} - \frac{1}{\sqrt{x}}}{h} \right)$$

$$= \lim_{h \rightarrow 0} \left( \frac{\frac{1}{h} \frac{\sqrt{x} - \sqrt{x+h}}{\sqrt{x+h} \cdot \sqrt{x}}}{h} \right)$$

$$= \lim_{h \rightarrow 0} \left( \frac{-1}{\sqrt{x+h} \cdot \sqrt{x} (\sqrt{x} + \sqrt{x+h})} \right)$$

$$= \frac{-1}{\sqrt{x} \cdot \sqrt{x} (\sqrt{x} + \sqrt{x})}$$

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

Simplify (conjugate!)

$$\frac{1}{h} \left( \frac{\sqrt{x} - \sqrt{x+h}}{\sqrt{x+h} \cdot \sqrt{x}} \right) \cdot \frac{(\sqrt{x} + \sqrt{x+h})}{(\sqrt{x} + \sqrt{x+h})}$$

$$= \frac{1}{h} \left( \frac{x - (x+h)}{(\sqrt{x+h} \cdot \sqrt{x}) (\sqrt{x} + \sqrt{x+h})} \right)$$

$$= \frac{-h}{h(\sqrt{x+h} \cdot \sqrt{x})(\sqrt{x} + \sqrt{x+h})}$$