Slopes of Secant and tangent Lines

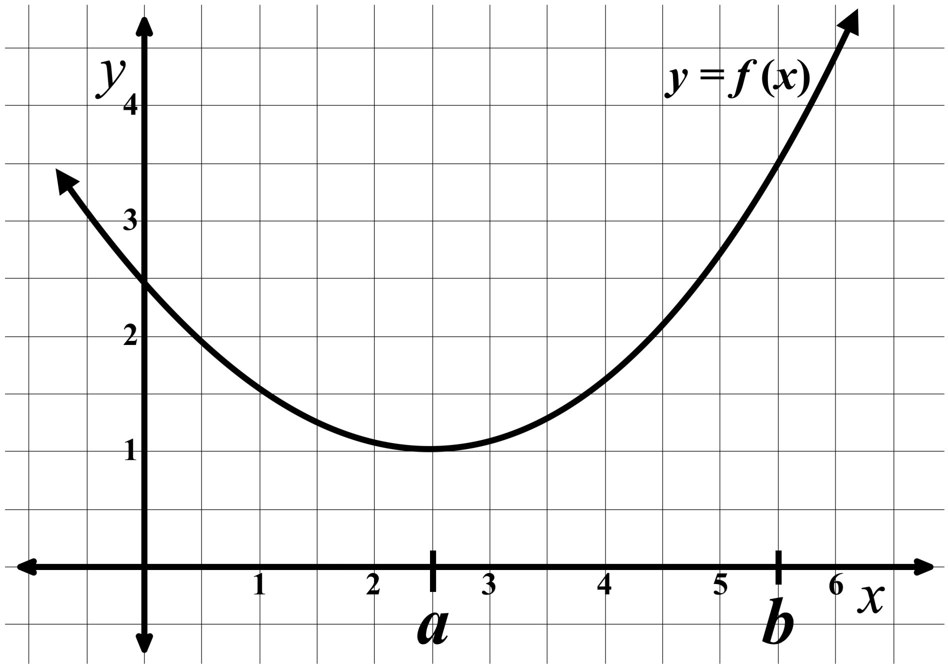
1. Suppose $f'(x)$ is decreasing for $2 \leq x \leq 7$. Let $y = L(x)$ represent the equation of the linear function tangent to the graph of f at the point $(2, f(2))$. Which of the following is true? (*Hint: Draw a picture.*)

   (a) $L(3) > f(3)$.
   (b) $L(3) < f(3)$.
   (c) $L(3) = f(3)$.
   (d) There is not enough information to compare $L(3)$ and $f(3)$.

2. The equation of the line tangent to the graph of $f(x) = \sin(x)$ when $x = \dfrac{\pi}{6}$ is:

   (a) $y = -\dfrac{\sqrt{3}}{2}\left(x - \dfrac{\pi}{6}\right) - \dfrac{1}{2}$
   (b) $y = -\cos(x)\left(x - \dfrac{\pi}{6}\right) + \dfrac{\sqrt{3}}{2}$
   (c) $y = \dfrac{1}{2}\left(x - \dfrac{\pi}{6}\right) + \dfrac{\sqrt{3}}{2}$
   (d) $y = \cos(x)\left(x + \dfrac{\pi}{6}\right) + \dfrac{1}{2}$
   (e) $y = \dfrac{\sqrt{3}}{2}\left(x - \dfrac{\pi}{6}\right) + \dfrac{1}{2}$

3. The graph of the function $y = f(x)$ is below. Note that the scales on the x and y axes are the same. Which of the following inequalities is true?



a. $\lim_{h\to 0} \dfrac{f(a+h)-f(a)}{h} < f(b)-f(a) < \dfrac{f(b)-f(a)}{b-a}$

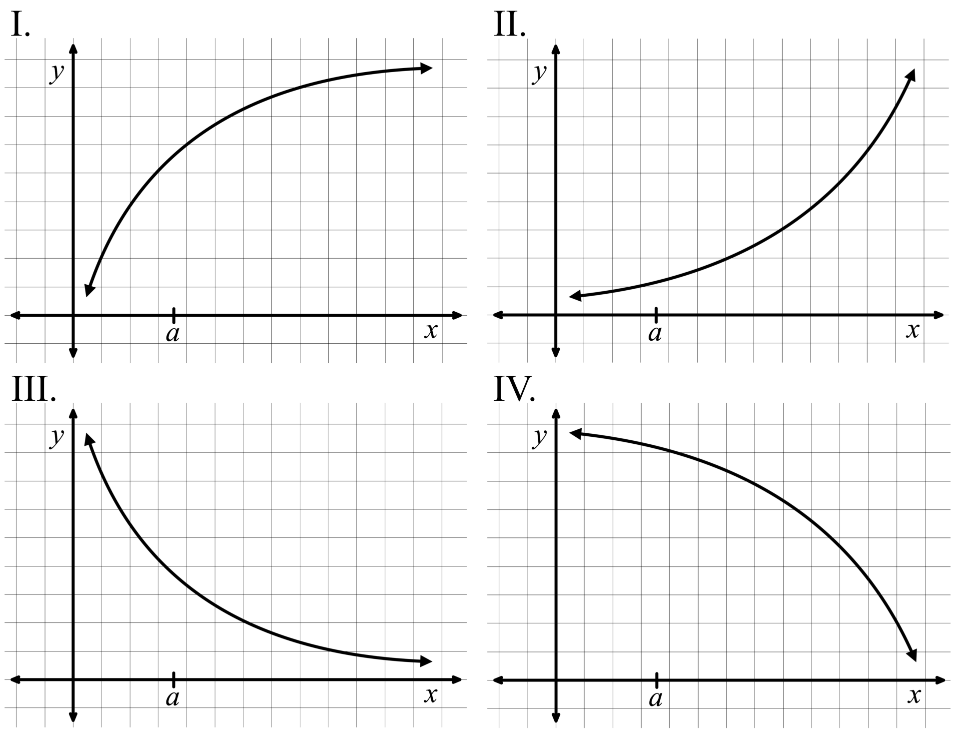
b. $\dfrac{f(b)-f(a)}{b-a} < \lim_{h\to 0} \dfrac{f(a+h)-f(a)}{h} < f(b)-f(a)$

c. $\lim_{h\to 0} \dfrac{f(a+h)-f(a)}{h} < \dfrac{f(b)-f(a)}{b-a} < f(b)-f(a)$

d. $f(b)-f(a) < \dfrac{f(b)-f(a)}{b-a} < \lim_{h\to 0} \dfrac{f(a+h)-f(a)}{h}$

e. $\dfrac{f(b)-f(a)}{b-a} < f(b)-f(a) < \lim_{h\to 0} \dfrac{f(a+h)-f(a)}{h}$

4. Suppose $f'(a) > \dfrac{f(a+\Delta x) - f(a)}{\Delta x}$ for $\Delta x > 0$. Which of the following could be a graph of f?



a. I only

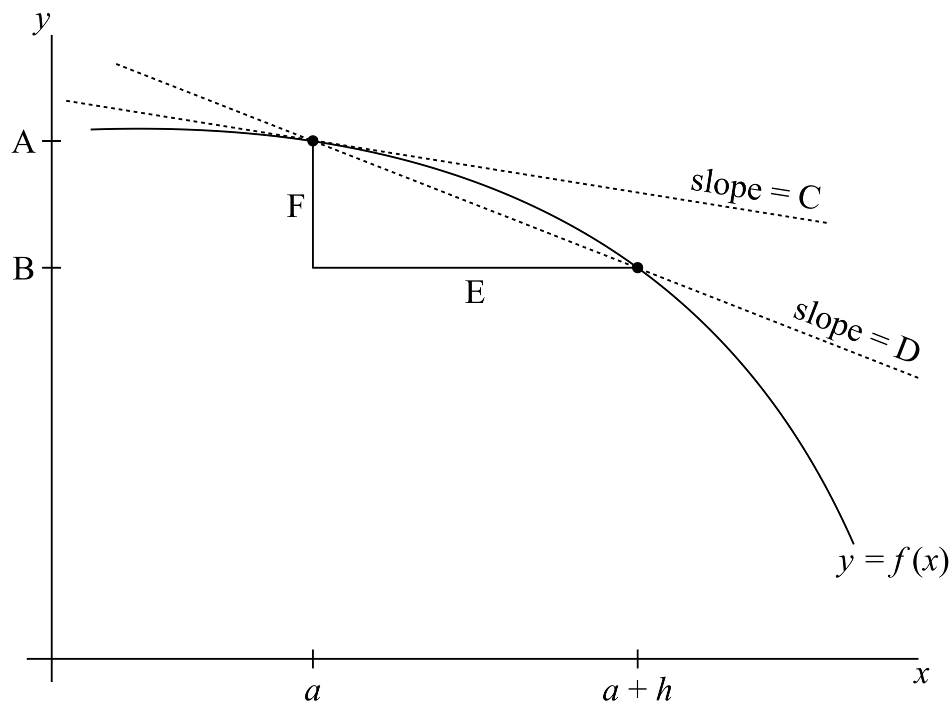
b. II only

c. II and III only

d. I and IV only

e. III and IV only

5. Consider the graph of $y = f(x)$ illustrated below.



Write each graphical quantity, A-F, in the blank next to corresponding expression on the left.
Each letter will be used exactly once.

Expression		**Graphical Quantity**
h	________	A
$f(a)$	________	B
$f(a+h)$	________	C
$f(a+h) - f(a)$	________	D
$\dfrac{f(a+h) - f(a)}{h}$	________	E
$\lim\limits_{h \to 0} \dfrac{f(a+h) - f(a)}{h}$	________	F