

Essentials of Calculus

Homework 2.2 The derivative function

1. Let $f(x) = 2x^2$. Approximate the following values.

a) $f'(-1)$.

Numeric answer: $f'(-1) \approx -4$

b) $f'(0)$.

Numeric answer: $f'(0) \approx 0$

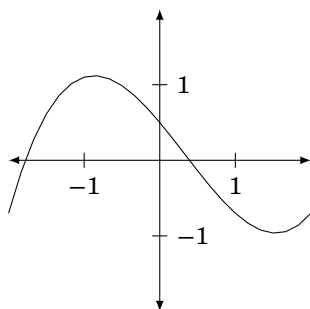
c) $f'(1)$.

Numeric answer: $f'(1) \approx 4$

d) $f'(2)$.

Numeric answer: $f'(2) \approx 8$

2. Let $f(x)$ be the function with the following graph.

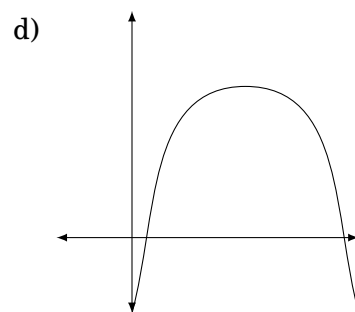
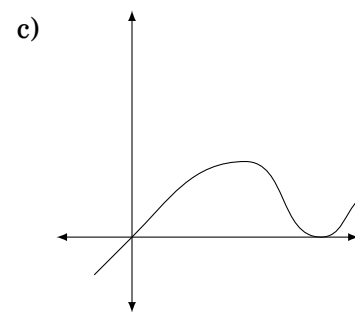
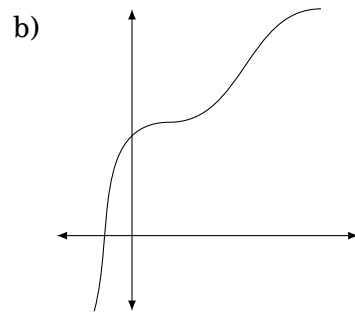
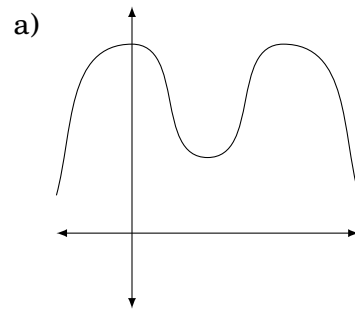


a) Draw the tangent lines to the graph at $x = -1, 0, 1$.

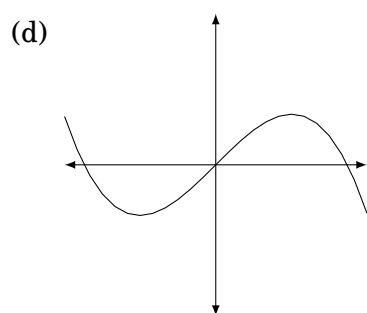
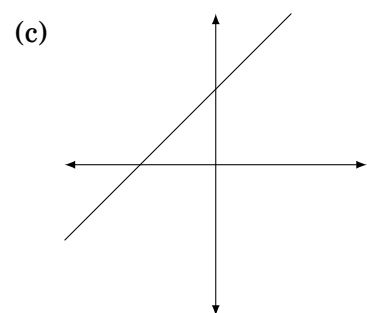
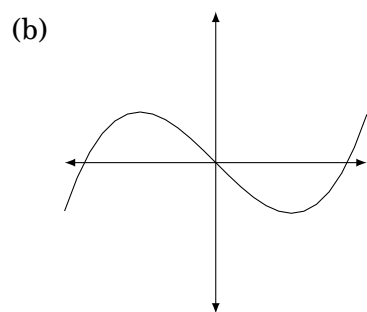
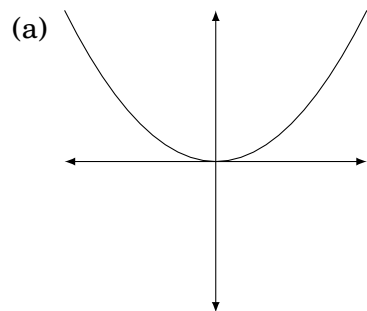
b) Approximate $f'(-1), f'(0), f'(1)$.

c) Sketch the graph of f' .

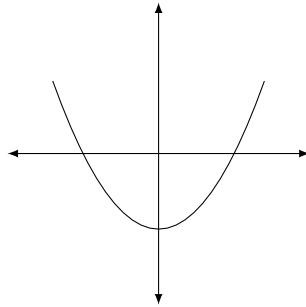
3. For the functions given by the following graphs, sketch the graph of the derivative.



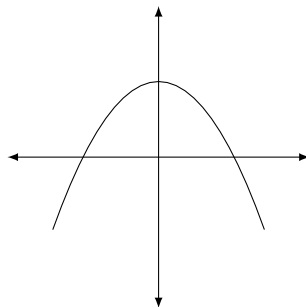
4. Match the graphs of the functions ((a)-(d)) with the graphs of their derivatives (I-IV).



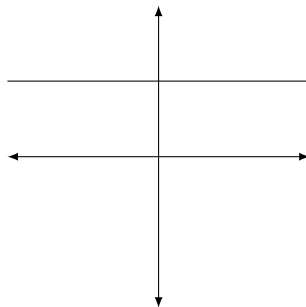
(I)



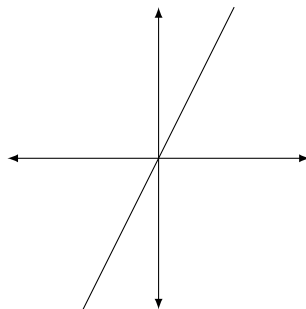
(II)



(III)



(IV)



5. For each of the following, sketch the graph of a function which matches the description.

- a) $f'(x) > 0$ for $x < 0$, $f'(0) = 0$, $f'(x) < 0$ for $0 < x < 2$, $f'(2) = 0$, $f'(x) > 0$ for $x > 2$.

- b) $f'(x) < 0$ for $x < 1$, $f'(1) = 0$, $f'(x) > 0$ for $1 < x < 1.5$,
 $f'(1.5) = 0$, $f'(x) < 0$ for $1.5 < x < 3$, $f'(3) = 0$, $f'(x) > 0$ for
 $x > 3$.
- c) $f'(x) > 0$ for $x < 0$, $f'(0) = 0$, $f'(x) > 0$ for $0 < x < 1$, $f'(1) = 0$,
 $f'(x) > 0$ for $x > 1$.
- d) $f'(x) > 0$ for $x < 0$, $f'(0) = 0$, $f'(x) > 0$ for $0 < x < 1$, $f'(1) = 0$,
 $f'(x) < 0$ for $1 < x < 3$, $f'(3) = 0$, $f'(x) < 0$ for $x > 3$.