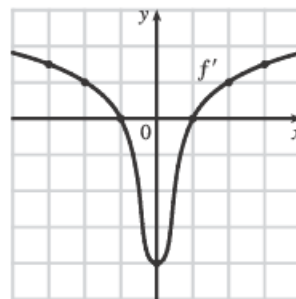
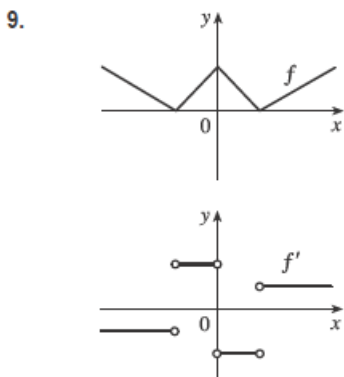
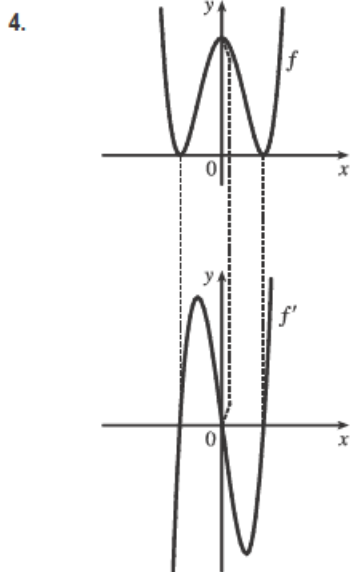


1. It appears that f is an odd function, so f' will be an even function—that is, $f'(-a) = f'(a)$.

- (a) $f'(-3) \approx 1.5$
- (b) $f'(-2) \approx 1$
- (c) $f'(-1) \approx 0$
- (d) $f'(0) \approx -4$
- (e) $f'(1) \approx 0$
- (f) $f'(2) \approx 1$
- (g) $f'(3) \approx 1.5$



3. (a)' = II, since from left to right, the slopes of the tangents to graph (a) start out negative, become 0, then positive, then 0, then negative again. The actual function values in graph II follow the same pattern.
- (b)' = IV, since from left to right, the slopes of the tangents to graph (b) start out at a fixed positive quantity, then suddenly become negative, then positive again. The discontinuities in graph IV indicate sudden changes in the slopes of the tangents.
- (c)' = I, since the slopes of the tangents to graph (c) are negative for $x < 0$ and positive for $x > 0$, as are the function values of graph I.
- (d)' = III, since from left to right, the slopes of the tangents to graph (d) are positive, then 0, then negative, then 0, then positive, then 0, then negative again, and the function values in graph III follow the same pattern.



$$20. f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} = \lim_{h \rightarrow 0} \frac{[m(x+h) + b] - (mx + b)}{h} = \lim_{h \rightarrow 0} \frac{mx + mh + b - mx - b}{h}$$

$$= \lim_{h \rightarrow 0} \frac{mh}{h} = \lim_{h \rightarrow 0} m = m$$

Domain of f = domain of f' = \mathbb{R} .

$$21. f'(t) = \lim_{h \rightarrow 0} \frac{f(t+h) - f(t)}{h} = \lim_{h \rightarrow 0} \frac{[5(t+h) - 9(t+h)^2] - (5t - 9t^2)}{h}$$

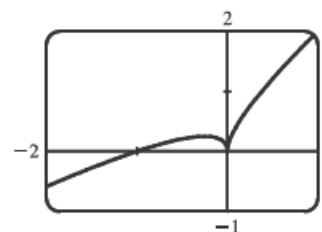
$$= \lim_{h \rightarrow 0} \frac{5t + 5h - 9(t^2 + 2th + h^2) - 5t + 9t^2}{h} = \lim_{h \rightarrow 0} \frac{5t + 5h - 9t^2 - 18th - 9h^2 - 5t + 9t^2}{h}$$

$$= \lim_{h \rightarrow 0} \frac{5h - 18th - 9h^2}{h} = \lim_{h \rightarrow 0} \frac{h(5 - 18t - 9h)}{h} = \lim_{h \rightarrow 0} (5 - 18t - 9h) = 5 - 18t$$

Domain of f = domain of f' = \mathbb{R} .

37. f is not differentiable at $x = -1$, because the graph has a vertical tangent there, and at $x = 4$, because the graph has a corner there.

39. As we zoom in toward $(-1, 0)$, the curve appears more and more like a straight line, so $f(x) = x + \sqrt{|x|}$ is differentiable at $x = -1$. But no matter how much we zoom in toward the origin, the curve doesn't straighten out—we can't eliminate the sharp point (a cusp). So f is not differentiable at $x = 0$.



41. $a = f, b = f', c = f''$. We can see this because where a has a horizontal tangent, $b = 0$, and where b has a horizontal tangent, $c = 0$. We can immediately see that c can be neither f nor f' , since at the points where c has a horizontal tangent, neither a nor b is equal to 0.