

1. **Warm up:** On what sets are the following functions defined?

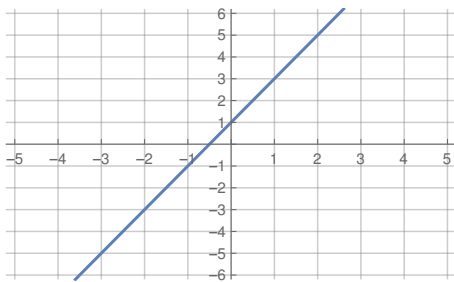
- (a) $\ln(x)$ (c) $\sqrt{\ln(x)}$ (e) $\sqrt{\ln(|x|)}$ (g) $\sqrt{|\ln(|x+1|)|}$
 (b) \sqrt{x} (d) $\sqrt{|\ln(x)|}$ (f) $\sqrt{|\ln(|x|)|}$ (h) $\sqrt{|\ln(|x|+1)|}$

2. Using the laws of derivatives that you know, find the derivatives of the following functions.

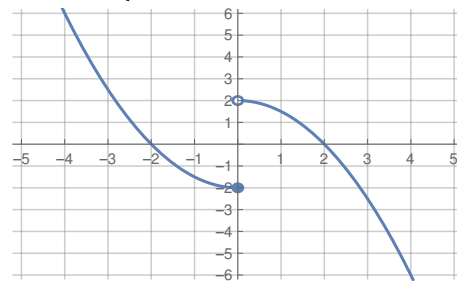
- (a) $3x^2 - \sqrt{3x} + 2$ (c) $12x^{9/11} + \frac{7x^{-2}}{3x} + 99$
 (b) $3x^{-4} - 4x^{-3}$ (d) $\frac{3x^2 - 9x^{10} + 77 - 3x^{1/6}}{x^5}$

3. For each of the following functions, draw their derivative on top of the given graph. Be sure to indicate (with an open circle) where the derivative is not defined.

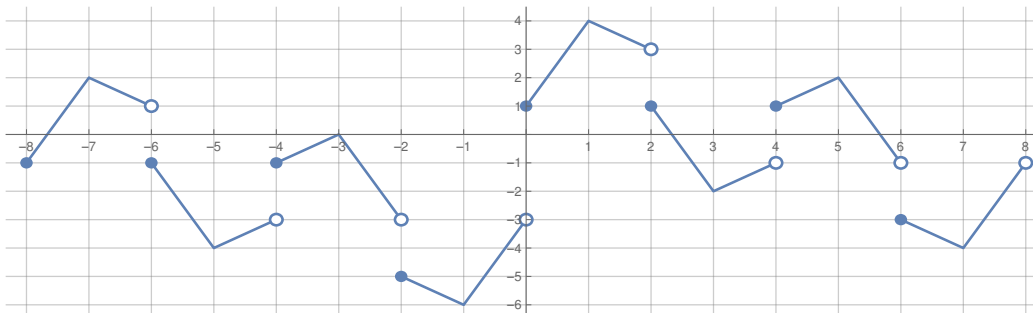
(a) $f(x) = 3x + 1$



(b) $g(x) = \begin{cases} (x^2-4)/2 & x \leq 0 \\ (4-x^2)/2 & x > 0 \end{cases}$



(c)



4. Let $f(x) = x^2 - 9x$.

- (a) Using the limit definition of the derivative, find the derivative $f'(x)$.
 (b) Find the equation of the tangent line to f at $x = 2$.

5. The position of an object on the plane is given by $s(t) = \begin{cases} t/2 & t \in [0, 8) \\ 4 & t \in [8, 10) \\ 4 - (t - 10)^2 & t \in [10, \infty). \end{cases}$

- (a) Find the velocity of the object.
 (b) Find the acceleration of the object.