BBA9
BITL2

Worksheet 7

Math Lab
Fall 2020

22 October 2020

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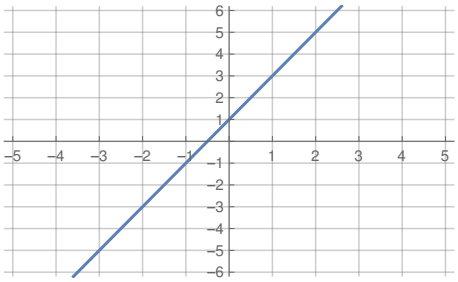
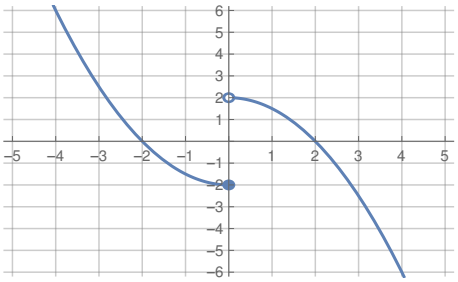
1. **Warm up:** Answer the following questions.
   (a) How many vertical asymptotes can a function have?
   (b) How many horizontal asymptotes can a function have?
   (c) On what set is the function $\ln(x)$ defined? What about $\sqrt{\ln(x)}$?

2. Using the laws of derivatives that you know, find the derivatives of the following functions.
   (a) $3x^2 - \sqrt{3x} + 2$
   (b) $3x^{-4} - 4x^{-3}$
   (c) $12x^{9/11} + \frac{7x^{-2}}{3x} + 99$
   (d) $\frac{3x^2 - 9x^{10} + 77 - 3x^{1/6}}{x^5}$

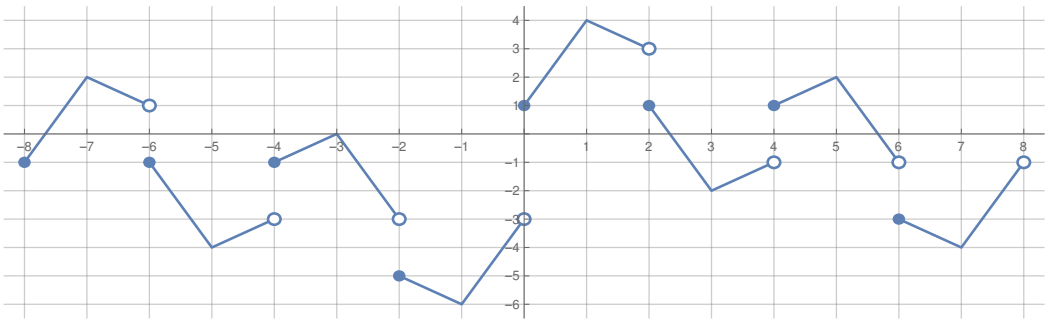
3. For each of the following functions, draw their derivative on top of the given graph. Be sure to indicate (with an open circle) where the derivative is not defined.
   (a) $f(x) = 3x + 1$



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



   (c)



4. Let $f(x) = x^3 - 9x$.
   (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.