BBA9
BITL2

Worksheet 13

Math Lab
Fall 2020

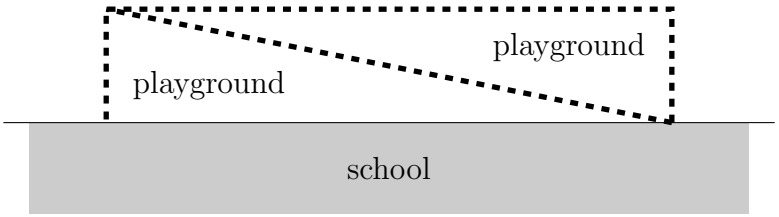
3 December 2020

1. **Warm up:** Answer the following questions.
   (a) On what interval(s) is the function $f(x) = x^2 - 2$ monotonic?
   (b) What is the difference between the first and the second derivative test?
   (c) True or False: If f has a critical point at x, then $f'(x) = 0$.

2. For each of the functions below, identify all horizontal, vertical, and slant asymptotes.
   (a) $f(x) = \dfrac{3x-4}{4x-3}$
   (b) $g(x) = \dfrac{x^2 - 18 + 7x}{x-2}$
   (c) $h(x) = \dfrac{\arctan(x)}{(x+\pi)^2}$
   (d) $k(x) = \dfrac{9x^2+3x-7}{x-\frac{1}{2}}$
   (e) $\ell(x) = \begin{cases} \frac{4x+2}{9x+1} & x < 0 \\ \frac{2x}{7x+6} & x \geqslant 0 \end{cases}$

3. Sktech the graph of the function $f(x) = \frac{3x^2+2x-1}{x^2-x-1}$, taking care to label all x- and y-intercepts and all asymptotes.

4. Two triangular playgrounds are to be built adjacent to a school. Two hundred meters of fencing are to be used for the three sides and the diagonal dividing fence as in the picture, with the aim of maximing the area of the two playgrounds together.



   (a) What is the equation whose solution will give these dimensions?
   (b) Do you know a solution exists? Why or why not?

5. Find a formula for each of the following sequences, and determine if they converge or diverge. The first term given in each sequence is for $n = 1$.
   (a) $16, 25, 36, 49, \ldots$
   (b) $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \ldots$
   (c) $1, \frac{-1}{4}, \frac{1}{27}, \frac{-1}{256}, \ldots$
   (d) $-1, 1, -1, 1, -1, 1, \ldots$
   (e) $0, 1, 0, 1, 0, \ldots$
   (f) $1, 1, 2, 2, 3, 3, 4, \ldots$