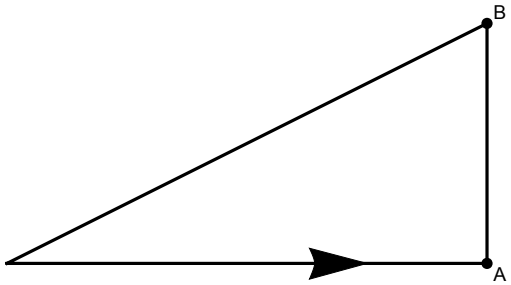
Calc I - Review for Exam III

There will be an exam next Monday, November 19 and many of the problems will be like something on this review sheet.

1. Find an equation of the line that is tangent to the curve satisfying $x^3 - 3x^2y^3 + y^4 = -1$ at the point $(1, 1)$.
2. Let $f(x) = 3 + 2x - x^2$. Find the absolute maximum and minimum values of f over the interval $[0, 3]$.
3. Let $f(x) = 3x^4 - 4x^3 - 12x^2$
   (a) Find all the critical points of f.
   (b) Sketch a rough graph of f.
   (c) Find the absolute minimum value of f.
   (d) Find the locations of any other local extremes of f.
4. The top of a 15 foot long ladder slides down a wall at 3 feet per second. How fast is the bottom of the ladder moving away from the wall when it is 12 feet away from the wall?
5. I'm 20 meters from point A and running straight toward it at 5 m/s as shown below. Suppose the point B is 10 meters from point A. At what rate is my distance from point B changing at this point in time?



6. Suppose I set up a rectangular corral to enclose 1000 square feet with inner partitions, as shown in figure 1. The material for the exterior portion costs twice as much as the material for the interior walls. What are the dimensions of the cheapest such corral?
7. Write down a right Riemann with $n = 5$ terms sum to estimate

$$\int_0^1 \sin(x)\, dx.$$

8. The speed of an object in meters per second is given by $v(t) = 1 + t^2$ over the time interval $0 \leq t \leq 2$.

   (a) Breaking the time interval into 4 pieces and using the speed of the object at $t = 0$, $t = 1/2$, $t = 1$, and $t = 3/2$, obtain an estimate of the total distance travelled over the time interval.

   (b) Is your estimate a bit bigger or a bit smaller than the actual distance travelled?

9. The speed of another object in meters per second is given by $v(t) = 1 + t$ over the time interval $0 \leq t \leq 2$. Find the exact distance the object travels over the time interval.

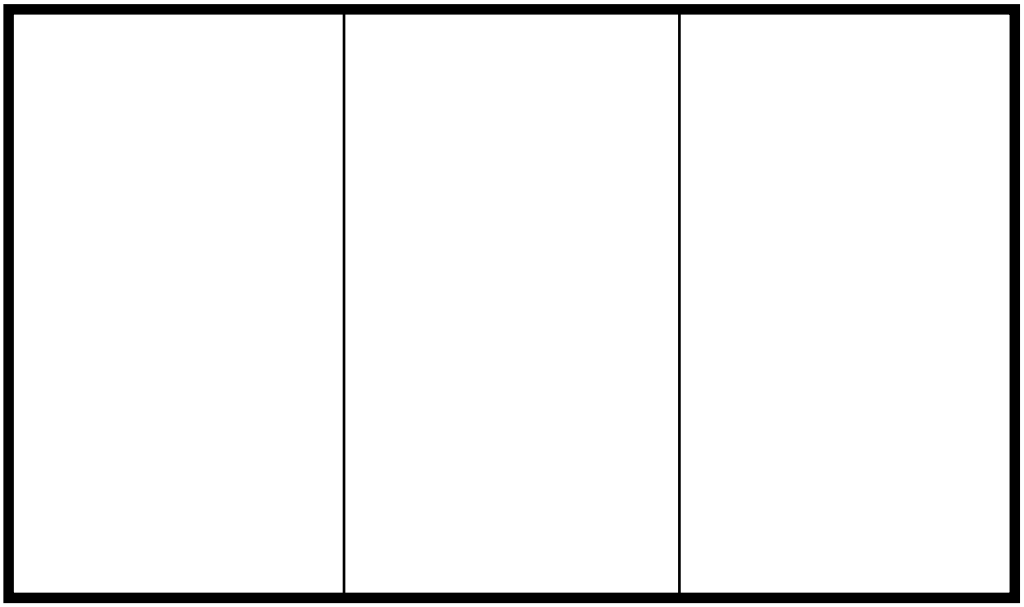


Figure 1: A corral