Tutorial 9

Week of November 12, 2018

1. Sketch the following curves. Consider domain, intercepts, asymptotes, intervals of increase/ decrease, local extrema, intervals of concavity, and inflection points.
   (a) $f(x) = x^3 + 3x^2$
   (b) $f(x) = \dfrac{x}{x-1}$

2. Find two positive numbers whose product is 100 and whose sum is a minimum.

3. Find the point on the curve $y = \sqrt{x}$ that is closest to the point $(3, 0)$.

4. For the following vectors, find $\mathbf{a} + \mathbf{b}$, $4\mathbf{a} + 2\mathbf{b}$, $|\mathbf{a}|$, and $|\mathbf{a} - \mathbf{b}|$.
   (a) $\mathbf{a} = \langle -3, 4 \rangle$, $\mathbf{b} = \langle 9, -1 \rangle$
   (b) $\mathbf{a} = 4\mathbf{i} - 3\mathbf{j} + 2\mathbf{k}$, $\mathbf{b} = 2\mathbf{i} - 4\mathbf{k}$

5. Find a unit vector that has the same direction as the given vector.
   (a) $\langle 6, -2 \rangle$
   (b) $-5\mathbf{i} + 3\mathbf{j} - \mathbf{k}$

6. Find a vector in the same direction as $\mathbf{v} = \langle 6, 2, -3 \rangle$ with length 4.