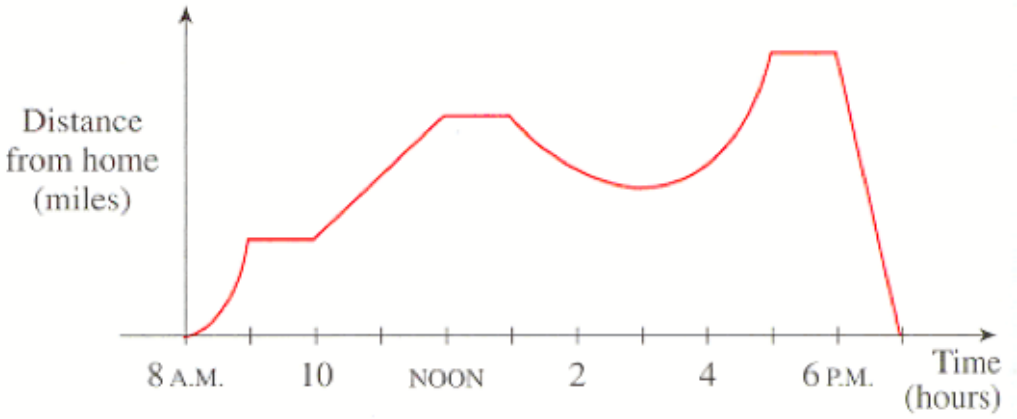
Department of Mathematics UAB
Calculus II

ASSIGNMENT 1

Calculus I Review and Vectors §10.1,10.2,10.3

Show all necessary calculations and relevant explanations. Numerical answers with no supporting explanations will receive no credit.

1. Over the course of a day an employer records the distance from the office of his salesperson via the GPS on the employee's cell phone, and these distances are graphed below:



   Assume that the salesperson only travels on a single straight road throughout the day.

   (a) What is happening at 8am?

   (b) What is happening from 8am to 9am?

   (c) What is happening from noon to 1pm? Lunch anyone?

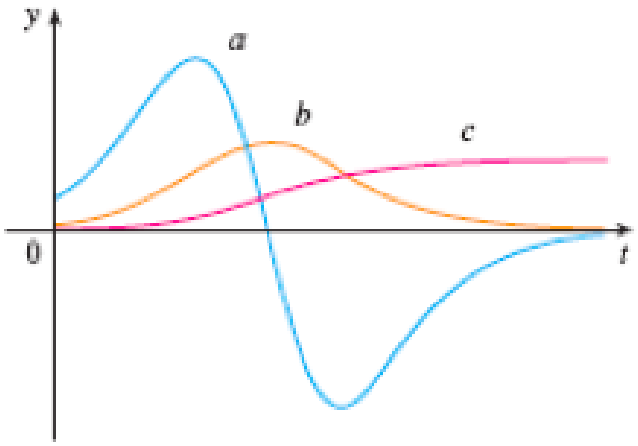
2. Evaluate
$$\lim_{x\to 8} \frac{x^2 + x - 72}{x - 8}$$

3. Consider the function f defined by
$$f(x) = 4x^2 - 3x$$

   (a) Find $f'(2)$.

   (b) Use your answer in (a) to to find an equation of the tangent line to the parabola $y = 4x^2 - 3x$ at the point $(2, 10)$.

4. The three graphs below are the graphs of the position function of a car, and the velocity and acceleration of the same car. Identify each graph and explain your reasoning for each selection.



5. A particle is known to have position at time $t = 1$ given by $s(1) = 2/3$ and velocity at time t given by

$$v(t) = \sqrt{t}.$$

Find $s(t)$, its position at time t.

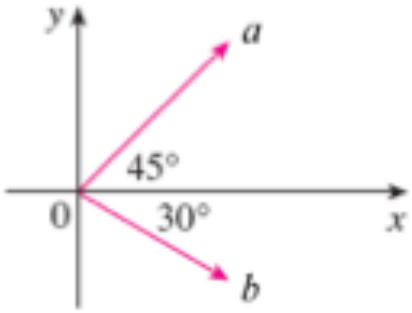
6. Draw a rectangular box with the origin $(0, 0, 0)$ and the point $(3, 4, 5)$ as diametrically opposite vertices, and having its faces parallel to the coordinate axes. Label all vertices of the box by stating their coordinates.

7. Let

$$\boldsymbol{a} = \langle 1, 2 \rangle, \quad \boldsymbol{b} = \langle 2, -1 \rangle$$

be two vectors in $\mathbb{R}^2$. Find $\boldsymbol{a}+\boldsymbol{b}$. Sketch $\boldsymbol{a}$, $\boldsymbol{b}$, and $\boldsymbol{a}+\boldsymbol{b}$, showing how they are related.

8. In the figure below the vector $\boldsymbol{a}$ represents a force of magnitude 5 pounds and $\boldsymbol{b}$ a force with magnitude 4 pounds, and $\boldsymbol{a} + \boldsymbol{b}$ is the resulting force when both $\boldsymbol{a}$ and $\boldsymbol{b}$ act at the same point. Find the magnitude of the resultant force $\boldsymbol{a} + \boldsymbol{b}$.



9. Use the dot product to find the angle between the two $\mathbb{R}^3$ vectors $\boldsymbol{a} = \langle 1, 1, 1 \rangle$ and $\boldsymbol{b} = \langle 1, 0, 0 \rangle$. This is the angle between the diagonal of the a unit cube and one of its edges.

10. Find the scalar and vector projections of the vector $\boldsymbol{b} = \langle 1, -1, 1 \rangle$ onto the vector $\boldsymbol{a} = \langle 1, 1, 1 \rangle$.