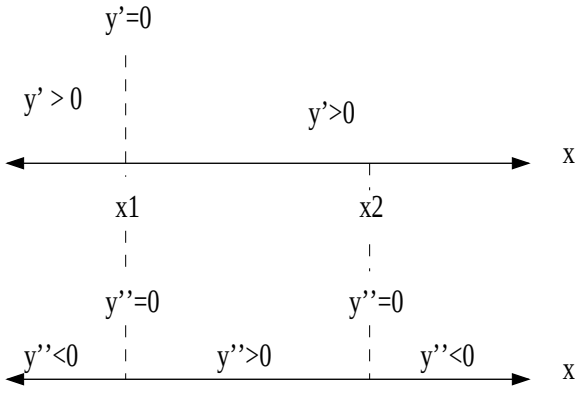
Sections 4.1 - 4.3
Local and Global Max/Min, Inflection points

1. Find the value of a so that the function $f(x) = xe^{ax}$ has a critical point at $x = 3$.

2. The Metal Can Co. has an order to make cans with a volume of 250 cubic centimeters. What should the dimensions of the cans be in order to use the least metal in their production.

3. Sketch a possible graph of $f = f(x)$ using the given information.



4. The oxygen supply, S, in the blood depends on the hematocrit, H, the percentage of red blood cells in the blood:

$$S = aHe^{-bH}$$

for positive constants a, b.

a. What value of H maximizes the oxygen supply? What is the maximum blood supply?

b. How does increasing the value of the constants a and b change the maximum value of S?

5. The function f has a derivative everywhere and has just one critical point, at $x = 3$. In parts (a)-(d), you are given additional conditions. In each case decide whether $x = 3$ is a local maximum, a local minimum, or neither. Explain your reasoning. Sketch possible graphs for all four cases.

a. $f'(1) = 4$ and $f'(5) = -1$

b. $f(x) \to \infty$ as $x \to \infty$ and as $x \to -\infty$

c. $f(1) = 1$, $f(2) = 2$, $f(4) = 4$, $f(5) = 5$

d. $f'(2) = -1$, $f(3) = 1$, $f(x) \to 3$ as $x \to \infty$