

- Show all your work for each problem; show enough work to fully justify your answer.
- Simplify all answers as far as possible.

(1) [Points: 8] Fill in the missing details in the following statement of the **Law of the Mean**: Let  $f$  be a function that satisfies the following two conditions:

(a)  $f$  is \_\_\_\_\_ on the closed interval  $[a, b]$ .

(b)  $f$  is \_\_\_\_\_ on the open interval  $(a, b)$ .

Then there is a number  $c \in (a, b)$  such that  $f'(c) =$  \_\_\_\_\_.

(2) [Points: 10] Solve for  $t$ :

(a)  $t^6 + 27t^3 = 0$ .

(b)  $t^6 + 27t^3 = x$ .

- (3) [Points: 10] The classic Farmer Problem: A farmer has 160 feet of fencing and a very long barn (200 ft. long). He (or she) wants to fence in a rectangular cattle pen of maximum area with the barn forming one side and the other side made up of the fencing. What should be the dimensions of the pen?