

Note: This is a practice midterm and is intended only for study purposes. The actual exam will contain different questions and perhaps a different layout.

1. TRUE/FALSE: Circle T in each of the following cases if the statement is *always* true. Otherwise, circle F.

T F All critical points are local extrema.

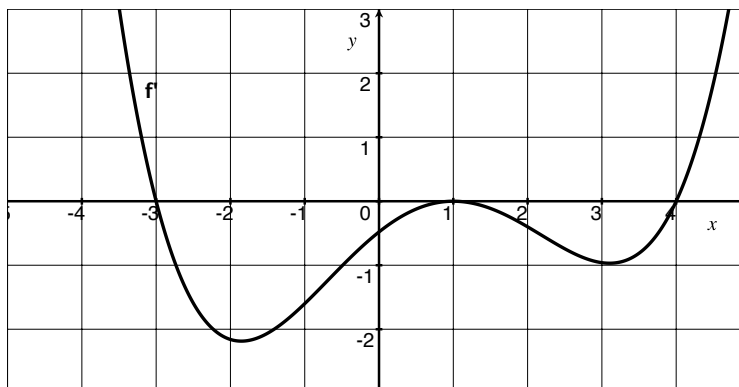
T F All local extrema are critical points.

T F If $f'(a) < 0$, then the graph of $f(x)$ is decreasing when $x = a$.

T F If C is the total cost function, then average cost is found by $C(q)/q$

Show your work for the following problems. The correct answer with no supporting work will receive NO credit (this includes multiple choice questions).

2. The following is the graph of the *derivative* of f . That is, the graph below is of f' .



- (a) Identify the x coordinates of any critical points of f .
- (b) Identify the x coordinates of any local maximums of f .
- (c) Identify the x coordinates of any points of inflection of f .

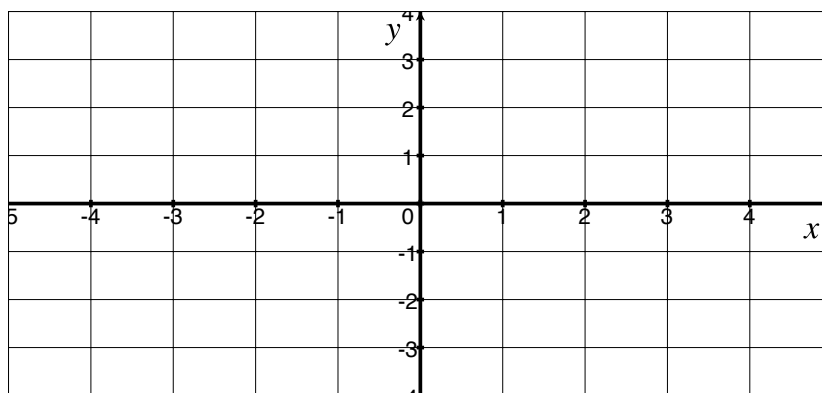
3. The total cost to produce q hundred units is $C(q) = q^2 \ln(q) - q \sin(q) + 2$.

(a) Find the cost of producing 150 units.

(b) Find the average cost of producing 150 units.

(c) Find the marginal cost of producing 150 units.

(d) Use your calculator to sketch the graph of C below. Assume x is in hundreds of units.



(e) Use the graph to estimate the quantity q that would minimize your average cost.

(f) Confirm your estimate by finding the minimal average cost analytically.

4. [] A manufacture has been selling 1000 televisions a week at \$360 each. A market survey indicates that for each \$26 rebate offered to a buyer, the number of sets sold will increase by 260 per week.

(a) Find a function that relates the price of televisions to the demand.

(b) How large a rebate should the company offer to a buyer in order to maximize its revenue?

(c) If the weekly cost function is $60000 + 120q$, where q is the number of television sets sold per week, how should it set the size of the rebate to maximize its profit?

5. [8] A commercial cattle ranch currently allows 20 steers per acre of grazing land; on the average its steers weight 2000 lb at market. Estimates by the Agriculture Department indicate that the average market weight per steer will be reduced by 50 lbs for each additional steer added per acre of grazing land. How many steers per acre should be allowed in order for the ranch to get the largest possible total market wight for its cattle?