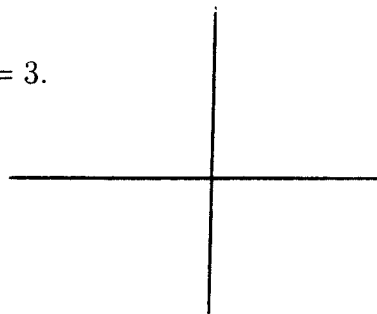


YOU MUST SHOW YOUR WORK TO RECEIVE CREDIT

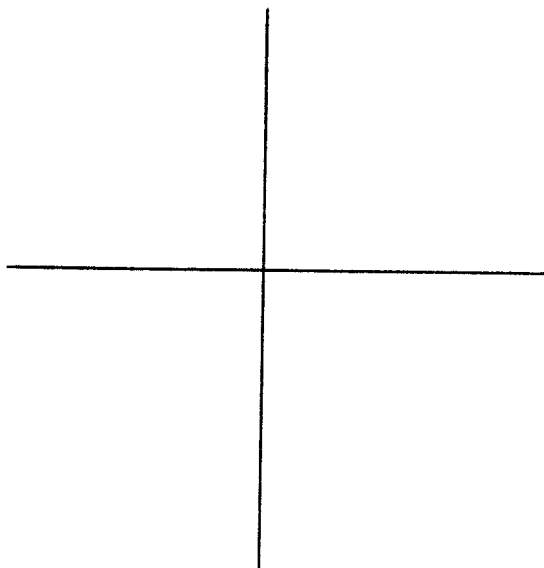
1. (10) A ball is thrown straight up in the air from a height of 156 feet. Its height after  $t$  seconds is  $s(t) = 96t - 16t^2 + 156$ .
- a) What is the initial velocity (when  $t = 0$ )?

b) When will the velocity be 0?

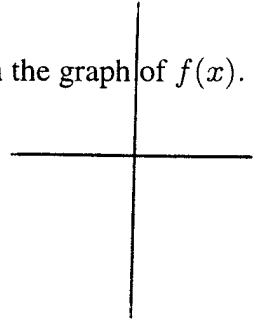
2. (5) Let  $y = f(x)$  be a function where  $f(4) = -2$ ,  $f'(4) = 1$ ,  $f''(4) = 3$ .  
Make a good sketch of  $f(x)$  near  $x = 4$ .



3. (15) Let  $f(x) = x^3 - 6x^2 + 9x + 3$ . Using calculus, determine where  $f(x)$  is increasing, decreasing, and where  $f(x)$  is concave up and concave down. Then sketch the graph.



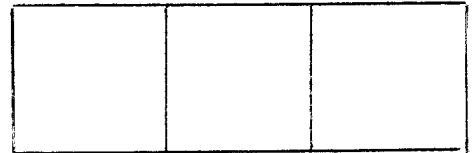
4. (10) Let  $f(x) = -x^2 + 8x - 20$ . Find the one relative extreme point. Then sketch the graph of  $f(x)$ .



5. (10) Let  $f(x) = \frac{x}{3} + \frac{12}{x} - 1$ ,  $x > 0$ . Find the one relative extreme point for  $f(x)$  with  $x > 0$  and determine whether it is a relative maximum point or a relative minimum point.

6. (15) You have 800 feet of fencing available to construct 3 pens as illustrated. Find the dimensions that will maximize the enclosed area.

a) Identify your variables.



b) Solve the problem.

7. (15) A fish farm raised 100 fingerlings in a pond. The average weight after one season was 6 pounds. For each additional fingerling placed in the pond, the average weight decreases by .05 pounds. How many fingerlings should be raised in order to maximize the total weight?

a) Identify your variables.

b) Solve the problem.

8. (10) The cost for producing  $x$  units is  $C(x) = \frac{1}{3}x^3 - 10x^2 + 120x + 200$ . Find the minimum marginal cost.

9. (10) The demand function for  $x$  units of a product is  $p = 400 - 10x$ . Find the value of  $x$  and the corresponding price that maximizes the revenue.