Each problem is worth 10 points. For full credit provide good justification for your answers.

1. Based on the values given in the table,

x	1	2	3	4	5
f(x)	-5	-1	-3	1	16
f'(x)	9	0	-3	0	9
f''(x)	-12	-6	0	6	12

- (a) What are the critical numbers of f?
- (b) Classify each of those critical numbers as a maximum, minimum, or inflection point.

2. Find the interval(s) on which $f(x) = x^3 - 9x^2 + 4$ is decreasing.

3. Find the interval(s) where $f(x) = x^3 - 9x^2 + 4$ is concave up.

4. [Stewart]Two cars start moving from the same point. One travels south at 60mi/h and the other travels west at 25 mi/h. At what rate is the distance between the cars increasing two hours later?

5. Find the absolute maximum and absolute minimum values of $f(x) = xe^{-x}$ on [0,3]

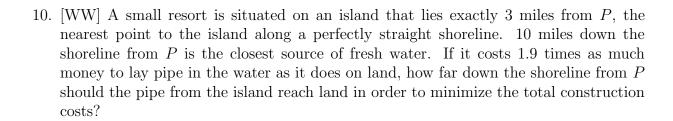
6.	Two real	numbers	add up	to 25. '	What is	s the larg	gest thei	r produc	t can be	?

7. Bunny is a calculus student at Enormous State University, and she's having some trouble. Bunny says "OMG! Why do they make it so confusing? I get the slopey parts, you know? But then they have this cavity part, which makes no sense because that's teeth, right? But so somehow the cavity tells you a max instead of a min or something, right? What's up with that?"

Help Bunny by explaining as clearly as you can how concavity connects to maxes and mins.

8. Approximate $\sqrt[3]{2}$ using Newton's Method with an initial value $x_0 = 2$ to calculate x_1 and x_2 .

9.	Jon is planning to start selling defective airpods on Temu. His research shows that if he sells them for \$20 he'll sell 500 per month, whereas if he sells them for \$21 he'll sell 450 per month. Assuming that demand is linear, what price should he set to maximize his revenue?



Extra Credit (5 points possible): For some values of b the graph of $y = x^4 - bx^2 + 3x + 5$ has two local minimums, and for other values of b it has only one. What can you say about which values of b produce which kind of graph?