

score	possible	problem
	20	1
	30	2
	25	3
	25	4
	100	

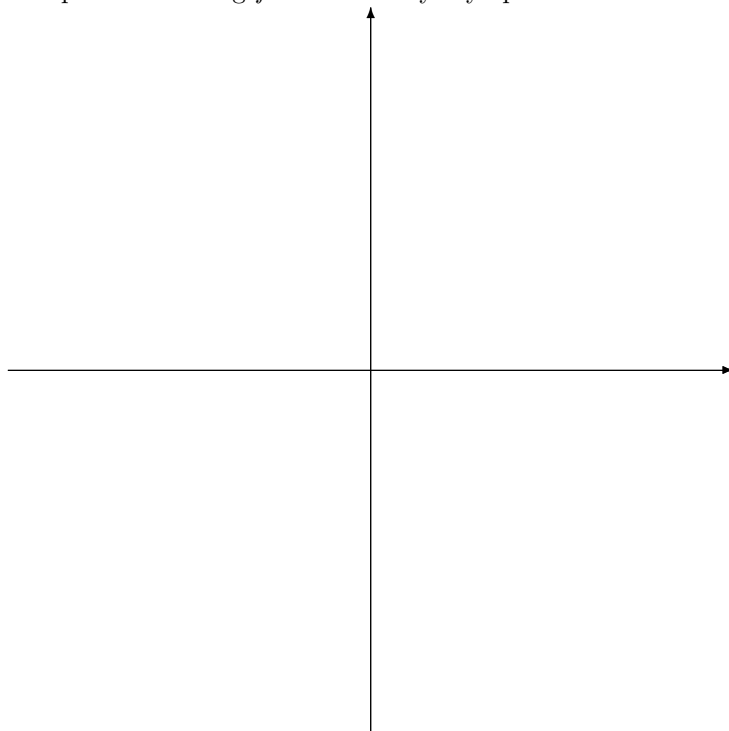
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Work in groups of 3 or 4. Show your work. Acknowledge any help on these specific problems.

1. Let $f(x) = \begin{cases} \ln(x) & \text{if } 0 < x < 1 \\ Ae^{-x} + B & \text{if } x \geq 1 \end{cases}$.

/10 (a) Find the values of A and B that make f differentiable.

/10 (b) Graph the resulting f . Indicate any asymptotes.



/15 2. (a) Find the absolute maximum and minimum values of f on the given interval.

$$f(x) = 3x^4 - 4x^3 - 12x^2 + 1 \quad \text{on} \quad [-2, 3]$$

/15 (b) Find the absolute maximum and minimum values of f on the given interval.

$$f(t) = t\sqrt{4 - t^2} \quad \text{on} \quad [-1, 2]$$

/10 3. (a) State Rolle's Theorem. Identify its hypotheses and its conclusions.

/15 (b) Verify that the function satisfies the three hypotheses of Rolle's Theorem on the given interval. Then find all numbers c that satisfy the conclusion of Rolle's Theorem.

$$f(x) = 5 - 12x + 3x^2 \quad \text{on} \quad [1, 3].$$

/10 4. (a) State the Mean Value Theorem. Identify its hypotheses and its conclusions.

/15 (b) Let f be a continuous function with $f(0) = 3$, $f(2) = 6$, $f'(x) = 0$ for $0 < x < 1$, and $f'(x) < 2$ for $1 < x < 2$. Sketch such a function or explain why it is impossible.