

Sample exam 2
Math 30, Fall 2004

This is the exam 2 from an old Math 30 class I taught. We have covered roughly the same material that class covered, but they covered a few things we have not covered (present in questions I have deleted) and vice versa. Therefore, you should treat this sample exam not as a guide to what will be covered in our exam, but as a guide to what the questions will be like.

You will be allowed to use the usual calculators and **ONE** 3×5 notecard. Unless otherwise stated, you must show all your work in a problem to receive full credit.

1. Let $h(x) = \ln(1 + \cos(2x + 3))$. Find $h'(x)$. No explanation necessary; do not simplify your answer.
2. Find the equation of the tangent line to $y = x^2 + e^{2-7x}$ at $x = -1$. No explanation necessary, but show all your work.
3. Suppose that $f(x)$ and $g(x)$ are functions such that $f(2) = 7$, $g(2) = 5$, $f'(2) = -13$, $g'(2) = -27$.
 - (a) Let $h(x) = \sqrt[3]{1 + f(x)}$. Find the value of $h'(2)$. Show all your work, and do not simplify your final answer.
 - (b) Let $k(x) = \frac{f(x)}{g(x) - x}$. Find the value of $k'(2)$. Show all your work, and do not simplify your final answer.
4. Suppose $f(x)$ is a function such that

$$f'(x) = xe^{2x}.$$

Note that this is the formula for the **derivative** of f , not the formula for f .

- (a) For which values of x is f increasing? **EXPLAIN** your answer in **ONE** sentence, and show all your work.
- (b) Give a rough sketch of the graph of f .

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5. The graph of a function $h(x)$ is drawn on the first set of axes below. Note that at $x = 3$, the graph of $h(x)$ has a non-differentiable “corner”; $h(x)$ is differentiable at all other values of x .

On the second set of axes, sketch the graph of $h'(x)$. Make sure that the important features of h' line up correctly with the corresponding features of h . If you are worried that your graph is unclear, you may want to write a few words of explanation on your graph.

