

Math 1A Midterm 2 2006-11-2 2:00-3:30pm.

You are allowed 1 sheet of notes. Calculators are not allowed. Each question is worth 3 marks, which will only be given for correct working and a clear and correct answer in simplified form.

1. Differentiate $\sin(\cos(\tan(x)))$.
2. Find an equation of the tangent line to the curve $y = 1/(\sin(x) + \cos(x))$ at the point $(0, 1)$.
3. Find dy/dx by implicit differentiation if $1 + x = \sin(xy^2)$.
4. Find a formula for the n 'th derivative of x^{-3} .
5. Differentiate $x^{\sin(x)}$.
6. Find the derivative of $\sinh(x) \tanh(x)$.
7. Use differentials or a linear approximation to estimate $\ln(.97)$.
8. Find the absolute maximum and absolute minimum values of $f(x) = x^3 - 3x - 1$ on the interval $[-3, 3]$.
9. Find all critical numbers of the function $f(x) = 5x^{2/3} + x^{5/3}$.
10. Show that the equation $2x - 1 - \sin(x) = 0$ has exactly one real root.
11. Find the intervals on which f is increasing or decreasing and all local maximum and minimum values of $f(x) = 3x^{2/3} - x$.
12. Find the limit $\lim_{x \rightarrow 0^+} \ln(x)/x$.
13. Find the limit $\lim_{x \rightarrow 0} (\cos(x) - 1 + x^2/2)/x^4$.

In questions 14 and 15 your sketch should show the domain of the function, local maxima and minima, where the function is increasing or decreasing, any zeros of the function, the behavior for large values of $|x|$, and the behavior near $x = 0$ and points where the function is not differentiable. You need not show convexity or points of inflection.

14. Sketch the curve $y = \sqrt[3]{x^2 - 1}$.
15. Sketch the curve $y = \ln(x)/x$ for $x > 0$.