

Lab for January 21

January 21, 2009

Today: Most labs will not be quite like this one. This is to give me some idea of where your abilities are at, and to be a review of calculus I. Indicate if you use the following rules in an answer by writing the corresponding abbreviation and circling it: Chain Rule (CR), Product Rule (PR), Quotient Rule (QR), L'Hôpital's Rule (LR), Integration by Substitution (IS), Fundamental theorem of Calculus (FTC).

1. Determine the following limits: $\lim_{x \rightarrow 5} x^2 + 1$, $\lim_{x \rightarrow \infty} \sin x$, $\lim_{x \rightarrow 2} \frac{x+2}{x^2-4}$, $\lim_{x \rightarrow -3} \frac{x+3}{x^2-9}$, and $\lim_{x \rightarrow \infty} 2^{-x}$.
2. Find the derivatives of the following functions with respect to x : $\cos x$, $\sin x$, $\tan^{-1} x$, $5x^7 + 2x^3 - 4x + 3$, $\frac{x^2+1}{x^2-1}$, $(x^2 + 2x + 7)^{20}$, $\sin^2 x + \cos^2 x$, 10^x , $\ln(x-1)$, $\ln e^x$, $x^{(\sin^2 x)}$, and $(x^2 - 5x)(\cos x)$.
3. Find the antiderivatives of the following functions with respect to x : $t^2 \cdot \cos x$, $\sin x \cdot \cos x$, $x^2 + 2x + 3$, 5 , $e^{x+1} + 1$, $x^{-1} + x$, $\frac{2}{1+x^2}$, and $f'(x)/f(x)$.
4. Find the (signed) area under the following functions on the corresponding intervals: $x^2 - 2x + 1$ on $[0, 1]$, $\sin^3 x$ on $[-\frac{\pi}{2}, \frac{\pi}{2}]$ (*Hint*: think about the geometry or use a trig identity), $\frac{2x}{x^2+1}$ on $[1, 2]$.
5. Describe (using appropriate calculus terms) the relationship of the position $x(t)$, and acceleration $a(t)$ of an ant moving along the x -axis to its velocity $v(t)$.
6. State the following rules in your own words/symbols, and ask me to look at your answers when you're done. If your group is uncertain about one of the rules, ask. Chain rule, product rule, quotient rule, L'Hôpital's rule, integration by substitution, fundamental theorem of calculus.