
name

Calculus Review

1. Calculate the derivatives, dy/dx , of the following functions:
 - a. $y = \cos kx$, where k is a constant
 - b. $y = \cot x = \cos x/\sin x$ (Work out the answer. Do not use the standard form for cotangent.)
 - c. $y = \csc x = 1/\sin x$
 - d. $y = x^m e^{-nx}$, where m and n are constant. At what value of x does y have a maximum or minimum? Hint, where does $dy/dx = 0$? What is that maximum value?
2. Integrate the following functions from $x = a$ to $x = b$:
 - a. $y = \sin kx$, where k is a constant
 - b. $y = 3x^3 - 2x^2 + x - 1$
 - c. $y = -\cos x \sin x$
3. Consider the following ordinary differential equation,

$$a \frac{d^2 y}{dx^2} + b \frac{dy}{dx} + cy = 0$$

Assume a solution of the form e^{kx} , and solve for k in terms of a , b , and c . Under what condition is k complex?

4. Compute $\partial z/\partial x$, $\partial z/\partial y$, $\partial^2 z/\partial x^2$, $\partial^2 z/\partial x \partial y$, and $\partial^2 z/\partial y^2$ of $z = x^3 y^2$.
5. Compute the divergence and curl of the velocity field below. Is this flow nondivergent, irrotational?

$$u = \ell \cos kx \sin \ell y$$

$$v = -k \sin kx \cos \ell y$$

Can you find a function, ψ , such that $u = -\partial \psi / \partial y$, and $v = \partial \psi / \partial x$?

Due Monday, 18SEP17. Work the problems on separate sheets of paper, as needed. Please lay your work out on the paper neatly and write clearly. Attach this sheet on top of the others.