Practice Test 2 — Math 264 — Fall 2009

October 21, 2009

Here are some types of problems that could appear on the test. They are intended to remind you of the material that we covered. There may be problems on the test which do not have the same format as these but have been covered in class.

1. Find the equation of a tangent line to the curve $r(t) = (t^2, \cos(t), t)$ at time $t = 1$.
2. Find the unit tangent vector to the curve $r(t) = (t, t^2, 2\cos(\pi/2))$ at time $t = -1$
3. Compute the derivative of $r(t) = (\cos(t), \sin(t), e^t)$ at $t = \pi$.
4. Integrate if $r(t) = (t, t^2 + 1, e^{2t})$ compute
$$\int_0^2 r(t)dt.$$
5. Reparametrize the curve
$$r(t) = \left(\frac{2}{t^2+1} - 1\right)\mathbf{i} + \frac{2t}{t^2+1}\mathbf{j}$$
in terms of arclength and conclude $r(t)$ parametrizes a circle.
6. Find and sketch the domain of the function $f(x, y) = \ln(xy)$.
7. Determine if
$$\lim_{(x,y)\to(0,0)} \frac{xy}{x^2+y^2}$$
exists. If it does determine the limit.
8. Sketch the level sets of the function $f(x, y) = e^{xy} + 1$.
9. Compute the gradient of $f(x, y, z) = x^2 + y^2 + e^{xyz}$.
10. Compute the second order power series approximation of $f(x, y) = x^2 + y^2 + e^{xy}$ centered at $(0, 0)$.
11. Find the equations of the plane tangent to the surface $z = e^{xy} + 1$ at the point $(0, 0, 2)$.
12. State the chain rule for partial derivatives.
13. If $z = e^{xy}\sin(x)$ where $x = s + t$ and $y = se^t$ compute $\frac{\partial z}{\partial s}$ and $\frac{\partial z}{\partial t}$ using the chain rule.
14. Find the directional derivative of the function $f(x, y) = \cos(x)y + e^{xy}$ at the point $(x, y) = (\pi, 0)$ in the direction $u = (1, 1)$.
15. Find the critical points of the function $f(x, y) = x^3 + 2xy + 1$ and determine if they are max's, min's or saddles using the second derivative test.
16. Find the extreme values of the function $x^2 + 2xy$ on the circle $x^2 + y^2 = 1$.