241 Final Fall 2012 Notes

1. (a) Formula!
   (b) You can just do $\bar{c} = \bar{a} - \bar{p}$.
   (c) Dot product and make sure you say at the end if they are and why, don't just show the numerical result.
   (d) Take the corss product of $\bar{a}$ and $\bar{b}$ to get the normal vector, then use the point.
2. (a) Use the formula and note the note.
   (b) Formula!
3. (a) This is the gradient. It doesn't need to be a unit vector unless specified.
   (b) Find the t which gets you the point, then find $\bar{r}'$ at that t. Make this a unit vector and then take the directional derivative of f at that point in that direction.
4. Note: This problem has an error: There is a minimum but no maximum. The constraint function is $g(x, y) = x^2 + (y - 2)^2$. Write down the three equations $f_x = \lambda g_x$, $f_y = \lambda g_y$ and $x^2 + y^2 = 4$ and solve for all possible (x, y). Plug these into f and select the largest and smallest.
5. This is a pretty straightfoward double integral as a vertically simple region. You'll need to find the intersection points to know the x limits.
6. (a) Fairly straightfoward, don't forget the polar r and don't forget to convert the integrand.
   (b) Yeah, just do it.
7. Use ST, the resulting surface is the portion of the paraboloid inside the cylinder, oriented downwards by the right-hand rule. Take the curl! When you parametrize Σ use r and θ.
8. (a) There's only one way to do the line integral of a function, just follow the method.
   (b) This is the Divergence Theorem. The diverence is a constant if you don't make any mistakes in the derivatives so then you can take that multiple of the volume to make it quick.