Final Exam Preparation

1. The exam is cumulative, covering chapters 12-16.
2. Any kind of problem that was fair game on previous tests is also fair game on the final.
3. More than half the questions on the final are multiple choice. Many of the multiple choice questions will be designed to test you on general concepts as opposed to specific problems.
4. You will be given a formula sheet for the exam (see website). Many of the formulas and theorems listed on the sheet do not include hypotheses.
5. Memorize the following formulas:

a) Area of a surface: $\iint_S dS = \iint_R \sqrt{1+[f_x(x,y)]^2+[f_y(x,y)]^2}\,dA = \iint_D \|\mathbf{r}_u \times \mathbf{r}_v\|dA$

b) Conservative vector field tests: $\frac{\partial Q}{\partial x} = \frac{\partial P}{\partial y}$ and **curl** $\mathbf{F}(x,y,z) = \mathbf{0}$

c) The line integral of f over $\boldsymbol{C}$:

$$\int_C f(x,y,z)ds = \int_a^b f(x(t),y(t),z(t))\|\mathbf{r}'(t)\|dt = \int_a^b f(x(t),y(t),z(t))\sqrt{[x'(t)]^2+[y'(t)]^2+[z'(t)]^2}\,dt\,.$$

d) Line integral of a vector field: $\int_C \mathbf{F}\bullet d\mathbf{r} = \int_a^b \mathbf{F}(x(t),y(t),z(t))\bullet \mathbf{r}'(t)dt$

e) Surface integral of f over $\boldsymbol{S}$:
$$\iint_S f(x,y,z)dS = \iint_R f(x,y,g(x,y))\sqrt{1+[g_x(x,y)]^2+[g_y(x,y)]^2}\,dA\,.$$

f) Surface integral of f over $\boldsymbol{S}$ (parametric):

$$\iint_S f(x,y,z)dS = \iint_D f(x(u,v),y(u,v),z(u,v))\|\mathbf{r}_u(u,v)\times\mathbf{r}_v(u,v)\|dA$$

g) Flux: $\iint_S \mathbf{F}\bullet\mathbf{N}dS = \iint_R \mathbf{F}\bullet(\pm\nabla G)dA$ or $\iint_S \mathbf{F}\bullet\mathbf{N}dS = \iint_D \mathbf{F}\bullet[\mathbf{r}_u(u,v)\times\mathbf{r}_v(u,v)]dA$

h) **Divergence Theorem**: $\iint_S \mathbf{F}\bullet\mathbf{N}dS = \iiint_Q \text{div}\mathbf{F}dV$

i) **Stoke's Theorem**: $\int_C \mathbf{F}\bullet d\mathbf{r} = \iint_S (\textbf{curl F})\bullet\mathbf{N}dS$

j) **FTLI**: $\int_C \mathbf{F}\bullet d\mathbf{r} = f(\text{end point}) - f(\text{beginning point})$, assuming **F** is conservative, and f a potential function for **F**.

k) **Green's Theorem**: $\int_C \mathbf{F}\bullet d\mathbf{r} = \int_C Pdx+Qdy = \iint_R \left(\frac{\partial Q}{\partial x}-\frac{\partial P}{\partial y}\right)dA$, (assuming C is a closed curve in the plane).

6. **Study Suggestions:**

a) If you don't have lot of time to prepare for the exam, then at least make sure you can do the problems that appear on previous tests. Also, study major concepts, such as important theorems and definitions.
b) If you need an "A" or "B" on the final, then (along with studying previous tests) I suggests you use your homework and lecture outlines as a study guide to prepare for this exam. Focus on the homework problems that are easy to moderate in difficulty level. Again, you should also study major concepts involving important theorems and definitions.
c) Many of the multiple-choice questions will focus on your ability to interpret the meaning of the concepts geometrically, numerically, and physically. Also, multiple choice questions are a nice format for testing your knowledge about theorems and definitions. So, don't just study particular problems, study major concepts as well.