Math 241 Σxam 4 Spring 2018 **∫ustin ∇∇yss-Gallifent**
May the fourth be with you!

Directions: Do not simplify unless indicated. No calculators are permitted. Show all work as appropriate for the methods taught in this course. Partial credit will be given for any work, words or ideas which are relevant to the problem.

Please put problem 1 on answer sheet 1

1. (a) Evalute $\int_C x\ ds$ where C is the line segment from $(1,1)$ to $(4,7)$. [10 pts]
   This should be evaluated.

   (b) Let Σ be the sphere $x^2+y^2+z^2=9$, oriented inwards. Use the Divergence Theorem to evaluate $\iint_\Sigma (2x\,\mathbf{i}+5z\,\mathbf{j}+5z\,\mathbf{k})\cdot\mathbf{n}\ dS$. [10 pts]
   This should be evaluated.

   Extra Credit: At the bottom of the first sheet put the date, time, building (code or full name) and room number of your final exam. [+3 pts]

Please put problem 2 on answer sheet 2

2. Use Green's Theorem to evaluate $\int_C y^3\ dx - x^3\ dy$ where C is the edge of the semicircle $x^2+y^2\leq 9$ in the first quadrant, oriented counterclockwise. [20 pts]
   This should be evaluated.

Please put problem 3 on answer sheet 3

3. Evaluate $\int_C \left(2xy+\frac{1}{y}\right)\ dx + \left(x^2-\frac{x}{y^2}\right)\ dy$ where C is the curve parametrized by $\mathbf{r}(t)=(t^2+t)\,\mathbf{i}+(t^3+2)\,\mathbf{j}$ for $1\leq t\leq 2$. [20 pts]

Please put problem 4 on answer sheet 4

4. Let C be the intersection of the cylinder $r=2\sin\theta$ with the paraboloid $z=9-x^2-y^2$ with counterclockwise orientation when viewed from above. Apply Stokes' Theorem to the line integral $\int_C x\ dx+xy\ dy+xz\ dz$. Parametrize the resulting surface and proceed until you have an iterated double integral. [20 pts]
   Do Not Evaluate This Integral.

Please put problem 5 on answer sheet 5

5. Let Σ be the part of the plane $2x+y=4$ in the first octant and between $z=0$ and $z=3$. Parametrize the surface and write down the iterated integral corresponding to the surface integral $\iint_\Sigma xy\ dS$. [20 pts]
   Do Not Evaluate This Integral.

The End and the TA Section List

Kevin	0111 ↔ 8:00	0121 ↔ 9:30
Noah	0112 ↔ 8:00	0122 ↔ 9:30
Nathaniel	0131 ↔ 12:30	0141 ↔ 2:00
Tessa	0132 ↔ 12:30	0142 ↔ 2:00