Math 3214: Homework 10 (Due Tuesday 4/22, 5pm)

To obtain (full) credit, show all reasoning and work.

No calculator or other electronic devices for HWs.

For problems 1-8:

(i) Include an appropriate sketch of the solid W, 2D region D, or curve C.

(ii) Include the orientation of curves and surfaces in your sketch.

(iii) Include the Ch. 7 and Ch. 8 formulas you used in each problem.

1. Section 8.3: 13. A very rough sketch of C using endpoints is sufficient.
2. Section 8.3: 19a.
3. Compute $\int_{\boldsymbol{c}} \boldsymbol{F} \cdot \, \mathrm{d}\boldsymbol{s}$ where $\boldsymbol{F}(x,y) = \Big((x^2+\sin(x^2))^5, \, -\cos(y^2)\Big)$ and C the circumference of the square $[-1,1]\times[-1,1]$.
4. Section 8.4: 3. You need to compute the triple integral and boundary integral.
5. Compute the flow rate out of the rectangular box $[0,1]\times[0,2]\times[0,3]$.
   The velociy is $\boldsymbol{v}(x,y,z) = (x^2+y^2, \, 3xz, \, 2)$.
6. Let W be the $x \le 0$ part of the solid enclosed by $z=1$ and $z = x^2+y^2$.
   Compute $\iint_{\partial W} \boldsymbol{F} \cdot \, \mathrm{d}\boldsymbol{S}$ where $\boldsymbol{F}(x,y,z) = (xz, \, x+yz, \, 2z^2)$.
7. Section 8.1: 12. You need to compute the double integral and boundary integral.
8. Let D be the 2D region enclosed by $y = 1-x^2$ and $y=0$ and $\boldsymbol{F}(x,y) = (2x, \, x)$.
   (a) Compute $\int_{\partial D} \boldsymbol{F}\cdot\boldsymbol{n} \, \mathrm{d}s$ directly, i.e. without integral theorem.
   (b) Compute $\int_{\partial D} \boldsymbol{F}\cdot\boldsymbol{n} \, \mathrm{d}s$ using Gauss' divergence theorem.