

Math 210 (Lesieutre)  
Exam review #1  
April 28, 2017

**Problem 1.** Try to recall the main integration theorems from this chapter.

a) Fundamental theorem for line integrals.

b) Green's theorem, circulation form.

c) Green's theorem, flux form.

d) Stokes' theorem

e) Divergence theorem

**Problem 2.** Find the equation for the tangent line to the curve  $\mathbf{r}(t) = \langle t, \sin t, 3 \rangle$  at the point  $(\pi, 0, 3)$ .

**Problem 3.** Let  $f(x, y) = x^2 - x + y^2$ . Find the absolute maximum and minimum of  $f(x, y)$  on a disk of radius 3 centered at the origin.

**Problem 4.** Consider the surface  $S$  defined by  $z = 1 + x + 2y$  and above the rectangle  $[1, 2] \times [2, 3]$ .

a) Set up an integral to compute the volume below  $S$  and above the  $xy$ -plane.

b) Set up an integral for the surface area of  $S$ .

c) Set up an integral for the flux of  $\langle x^2, y - z, 3 \rangle$  across  $S$ .

**Problem 5.** a) Consider the integral  $\int_{x=0}^3 \int_{y=0}^{x^3} xy \, dy \, dx$ . Sketch the region of integration, and reverse the order of the integrals.

b) Consider the integral  $\int_{x=0}^3 \int_{y=0}^{\sqrt{9-x^2}} e^{-x^2-y^2} \, dy \, dx$ . Convert this integral into polar coordinates.