

## MATH 255 - Vector Calculus and Linear Algebra

### EXERCISE SET 2

1. Let  $R$  be the region bounded by  $x - y = 0$ ,  $x + y = 1$  and  $x = 0$ . Evaluate the integral  $\iint_R e^{frac{x-y}{x+y}} dx dy$ .
2. Let  $R$  be the region bounded by  $x + y + z = 0$ ,  $x + y + z = 2$ ,  $x - y + z = -1$ ,  $x - y + z = 2$ ,  $x + y - z = 0$ , and  $x + y - z = 3$ . Evaluate the integral  $\iiint_R (3x + y + z) dx dy dz$ .
3. Let  $C$  be part of the curve  $y = x^2 - 4$  from  $(-2, 0)$  to  $(2, 0)$  and  $\alpha$  be the line segment joining  $(2, 0)$  to  $(-2, 0)$ . Let  $\vec{F}(x) = \left( 3x^2 e^{x^3} - 2x e^y - 2y, \cos(y^5) + x^2 \right)$ 
  - (a) Evaluate  $\int_{\alpha} \vec{F} \bullet d\vec{r}$
  - (b) Evaluate  $\int_{C+\alpha} \vec{F} \bullet d\vec{r}$  by Green's Theorem.
  - (c) Evaluate  $\int_C \vec{F} \bullet d\vec{r}$  using part (a) and part (b).

ANSWERS (Not the Solutions)

1.  $\frac{e-1}{4e}$
2.  $\frac{27}{2}$
3. (a)  $e^{-8} - e^8$  (b)  $\frac{64}{3}$  (c)  $\frac{64}{3} - e^{-8} + e^8$