Math 2471 Calc 3 - Homework #10

Pg. 1076, #3, and 7.
Pg. 1085, #5 and 7.
Pg. 1108, #5, 7, 19, 23, 25 and 31.

Pg. 1076 For the following show (a) the vector field is conservative and (b) verify that $\int_C \vec{F} \cdot d\vec{r}$ is the same for each parametric curve C

#3 $\vec{F}(x,y) = x^2\,\vec{i} + y\,\vec{j}$

(i) $C_1 : \vec{r}_1(t) = t\,\vec{i} + t^2\,\vec{j}, \quad 0 \le t \le 1$

(ii) $C_2 : \vec{r}_2(t) = \sin\theta\,\vec{i} + \sin^2\theta\,\vec{j}, \quad 0 \le \theta \le \pi/2$

#7 $\vec{F}(x,y,z) = y^2 z\,\vec{i} + 2xyz\,\vec{j} + xy^2\,\vec{k}$

(i) $C_1 : \vec{r}_1(t) = t\,\vec{i} + 2t\,\vec{j} + 4t\,\vec{k}, \quad 0 \le t \le 1$

(ii) $C_2 : \vec{r}_2(t) = \sin\theta\,\vec{i} + 2\sin\theta\,\vec{j} + 4\sin\theta\,\vec{k}, \quad 0 \le \theta \le \pi/2$

Pg. 1085 Verify Greens theorem by evaluating both integrals in

$$\int_C y^2 dx + x^2 dy = \iint_R \left(Q_x - P_y\right) dA \tag{1}$$

5. C boundary of the region lying between the graphs $y = x$ and $y = x^2$
7. C square with vertices $(0,0)$, $(1,0)$, $(1,1)$ and $(0,1)$

Pg. 1108 Evaluate $\iint_S (x - 2y + z)dS$

5. $S : z = 4 - x, \quad 0 \le x \le 4, \quad 0 \le y \le 3$
7. $S : z = 2, \quad x^2 + y^2 \le 1$

Pg. 1108 Evaluate $\iint_S f(x,y,z)dS$

19. $f(x,y,z) = x^2 + y^2 + z^2$
$S : \; z = x + y, \quad x^2 + y^2 \le 1$
23. $f(x,y,z) = x^2 + y^2 + z^2$
$S : \; x^2 + y^2 = 9, \;\; 0 \le x, y, \le 3, \;\; 0 \le z \le 9$

Due: Monday, July 25, 2022.