

UNIVERSITY OF REGINA
DEPARTMENT OF MATHEMATICS & STATISTICS
Mathematics 213-001

Quiz No. 3
200010
W 2000



Time: 20 minutes
Instructor: Dr. S.K. Kaul
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NAME: _____
STUDENT NO. _____

1. Evaluate the line integral

from 1 to 2

$$\int_C \mathbf{F} \cdot d\mathbf{R}$$

where $\mathbf{F} = (x+y)\mathbf{i} - x^2\mathbf{j} - 4y^2\mathbf{k}$, and $\mathbf{R}(t) = t\mathbf{i} + t^2\mathbf{j} + t^4\mathbf{k}$.

$$\begin{aligned} x &= t \\ y &= t^2 \\ z &= t^4 \end{aligned}$$

$$\frac{d\mathbf{R}}{dt} = \mathbf{i} + 2t\mathbf{j} + 4t^3\mathbf{k}$$
$$\mathbf{F} = (t+t^2)\mathbf{i} - t^2\mathbf{j} - 4t^4\mathbf{k}$$

$$\begin{aligned} &-4y^2 \\ &-4(t^2)^2 \\ &-4t^4 \end{aligned}$$

$$d\mathbf{R} = \left(\frac{d\mathbf{R}}{dt}\right) dt$$

$$\mathbf{F} \cdot \frac{d\mathbf{R}}{dt} = (t+t^2) - 2t^3 - 16t^7$$

oops

$$\int_1^2 (\mathbf{F} \cdot \frac{d\mathbf{R}}{dt}) dt = \int_1^2 (t+t^2 - 2t^3 - 16t^7) dt$$

-2

$$= \left[\frac{1}{2}t^2 + \frac{1}{3}t^3 - \frac{2}{4}t^4 - \frac{16}{8}t^8 \right]_1^2$$
$$= \left(\frac{4}{2} + \frac{8}{3} - \frac{32}{4} - \frac{4096}{128} \right) - \left(\frac{1}{2} + \frac{1}{3} - \frac{2}{4} - \frac{16}{8} \right)$$

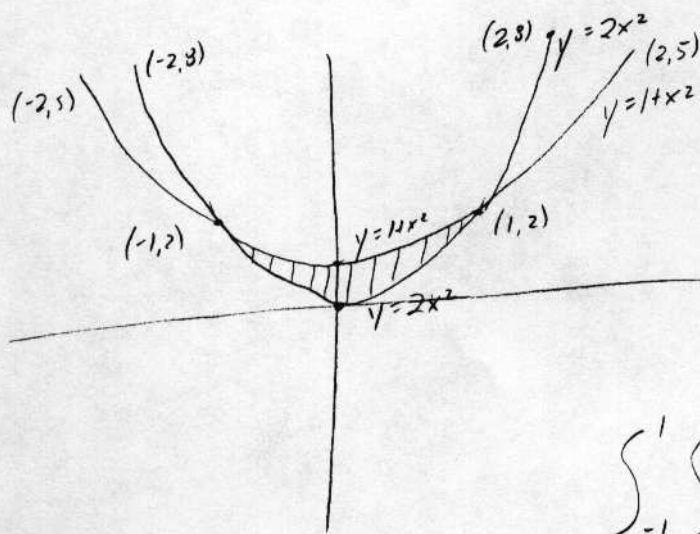
$$= -5463.67$$

$$\text{Def } \left\{ \begin{aligned} x &= x(t) \\ dx &= x'(t)dt \end{aligned} \right.$$

2. Evaluate

$$\iint_D (x + 2y) dA$$

where D is the region bounded by the parabolas $y = 2x^2$ and $y = 1 + x^2$. Draw the region.



solve.
 $(0,0)$ $(0,1)$ $(3,10)$
 $(1,2)$ $(1,2)$
 $(2,8)$ $(2,5)$

$$2x^2 = 1 + x^2$$

$$x^2 = 1$$

$$x = \pm 1$$

intersects at $(-1, 2)$ and $(1, 2)$
 How do you get this result?

$$\int_{-1}^1 \int_{2x^2}^{1+x^2} (x + 2y) dy dx$$

$$= \int_{-1}^1 [yx + y^2]_{2x^2}^{1+x^2} dx = \int_{-1}^1 [x(1+x^2) + (1+x^2)^2] - [2x^3 + 4x^4] dx$$

$$= \int_{-1}^1 (x + x^3 + 1 + 2x^2 + x^4 - 2x^3 - 4x^4) dx$$

$$= \int_{-1}^1 (x - x^3 + 1 + 2x^2 - 3x^4) dx$$

$$= \left[\frac{1}{2}x^2 + \frac{1}{4}x^4 + x + \frac{2}{3}x^3 + \frac{1}{5}x^5 - \frac{3}{4}x^4 - \frac{4}{5}x^5 \right]_{-1}^1$$

$$= \left(\frac{1}{2} + \frac{1}{4} + 1 + \frac{2}{3} + \frac{1}{5} - \frac{3}{4} - \frac{4}{5} \right) - \left(\frac{1}{2} + \frac{1}{4} - 1 - \frac{2}{3} - \frac{1}{5} + \frac{3}{4} + \frac{4}{5} \right)$$

$$= 1.133 \times$$

2.133

-2