Math 3C (21945) HW #9

Due at the beginning of lecture on Thursday, April 30th.

In order to receive a ✓, you must attempt all problems and write out all steps leading to your answers neatly and legibly. You cannot simply write the correct answer to demonstrate your mathematical understanding.

You must include your name, the course title and section number on the first page. All homework sets must be stapled. No late homework will be accepted without my express permission. You may receive a ✗ if these guidelines are not followed.

Good luck!

Evaluate the line integral of f(x,y) along the curve C.

1) $f(x, y) = \dfrac{x^2}{\sqrt{1 + 4y}}$, C: $y = x^2$, $0 \le x \le 4$ 1) _____

2) $f(x, y) = y^2 + x^2$, C: the perimeter of the circle $x^2 + y^2 = 9$ 2) _____

3) $f(x, y) = \cos x + \sin y$, C: $y = x$, $0 \le x \le \dfrac{\pi}{2}$ 3) _____

Evaluate the line integral along the curve C.

4) $\displaystyle\int_C (y + z)\, ds$, C is the straight–line segment $x = 0$, $y = 2 - t$, $z = t$ from (0, 2, 0) to (0, 0, 2) 4) _____

5) $\displaystyle\int_C (xz + y^2)\, ds$, C is the curve $\mathbf{r}(t) = (9 - t)\mathbf{i} + 2t\mathbf{j} - 2t\mathbf{k}$, $0 \le t \le 1$ 5) _____

Find the mass of the wire that lies along the curve r and has density δ.

6) $\mathbf{r}(t) = 3\mathbf{i} + (1 - 3t)\mathbf{j} + 4t\mathbf{k}$, $0 \le t \le 2\pi$; $\delta = 5(1 + \sin 4t)$ 6) _____

Find the work done by F over the curve in the direction of increasing t.

7) $\mathbf{F} = xy\mathbf{i} + 6\mathbf{j} + 4x\mathbf{k}$; C: $\mathbf{r}(t) = \cos 4t\mathbf{i} + \sin 4t\mathbf{j} + t\mathbf{k}$, $0 \le t \le \dfrac{\pi}{8}$ 7) _____

Test the vector field F to determine if it is conservative.

8) $\mathbf{F} = xy\mathbf{i} + y\mathbf{j} + z\mathbf{k}$ 8) _____

Verify the field is conservative and find the potential function f for the field F.

9) $\mathbf{F} = \left(\dfrac{1}{z}, -2, -\dfrac{x}{z^2}\right)$ 9) _____

10) $\mathbf{F} = \left\langle -\frac{1}{x}, \frac{1}{y}, -\frac{1}{z} \right\rangle$ 10) _____

Evaluate the work done between point 1 and point 2 for the conservative field F.

11) $\mathbf{F} = (y + z)\mathbf{i} + x\mathbf{j} + x\mathbf{k}$; $P_1(0, 0, 0)$, $P_2(7, 3, 9)$ 11) _____

Using Green's Theorem, compute the counterclockwise circulation of F around the closed curve C.

12) $\mathbf{F} = (x^2 + y^2)\mathbf{i} + (x - y)\mathbf{j}$; C is the rectangle with vertices at (0, 0), (7, 0), (7, 9), and (0, 9) 12) _____

13) $\mathbf{F} = xy\,\mathbf{i} + x\mathbf{j}$; C is the triangle with vertices at (0, 0), (6, 0), and (0, 5) 13) _____

14) $\mathbf{F} = -\sqrt{x^2 + y^2}\mathbf{i} + \sqrt{x^2 + y^2}\mathbf{j}$; C is the region defined by the polar coordinate inequalities $1 \le r \le 7$ and $0 \le \theta \le \pi$ 14) _____

Answer Key
Testname: M3C_HW_9

1) $\frac{64}{3}$

2) 54π

3) $2\sqrt{2}$

4) $4\sqrt{2}$

5) - 21

6) 50π units

7) $W = \frac{20}{3}$

8) Not conservative

9) $f(x, y, z) = \frac{x}{z} - 2y$

10) $f(x, y, z) = \ln\left(\frac{y}{xz}\right)$

11) $W = 84$

12) -504

13) - 15

14) 42