

Math 392 Quiz 5B

July 9, 2019

Name: \_\_\_\_\_

Instructions: No calculators! Answer all problems in the space provided! Do your rough work on scrap paper.

In this quiz, the less shorthand the better. For example, when writing a formula for which you need a normal vector  $\vec{n}$ , don't just write " $\vec{n}$ ", but rather the formula used to find it. Everything is positively oriented.

1. Let  $S_1$  be a surface parametrized by  $\vec{r}(u, v)$ . Find a formula for a normal vector  $\vec{n}_1$  to  $S_1$ :  $\vec{n}_1 =$  \_\_\_\_\_

2. Let  $S_2$  be a surface given by  $z = g(x, y)$ . Find a formula for a normal vector  $\vec{n}_2$  to  $S_2$ :  $\vec{n}_2 =$  \_\_\_\_\_

3. For  $S_1$  above, define  $\iint_{S_1} \vec{F}(x, y, z) \cdot d\vec{S} =$  \_\_\_\_\_

4. For  $S_2$  above, define  $\iint_{S_2} \vec{F}(x, y, z) \cdot d\vec{S} =$  \_\_\_\_\_

5. State the equation in the Divergence Theorem: \_\_\_\_\_

6. Describe what the symbols above are and how they relate to each other: \_\_\_\_\_

\_\_\_\_\_

7. State the equation in Stokes' Theorem: \_\_\_\_\_

8. Describe what the symbols above are and how they relate to each other: \_\_\_\_\_

\_\_\_\_\_

9. Let  $\vec{F} = \langle xyz, y, z \rangle$ . Let  $S$  be the part of  $z = x^2 + y^2$  that is below  $z = 9$ . Let  $C$  be the boundary curve of  $S$ . Fully set-up two integrals to compute the work done by  $\vec{F}$  in moving a particle around  $C$  counter-clockwise.

(a) Line integral: \_\_\_\_\_

(b) Double integral: \_\_\_\_\_

10. Let  $\vec{F} = \langle xyz, y, z \rangle$ . Let  $E$  be the region bounded by  $z = x^2 + y^2$  and  $z = 9$ . Let  $S$  be the boundary of  $E$ . Fully set-up two integrals to compute the flux out of the surface of  $E$ .

(a) Surface integral: \_\_\_\_\_

(b) Triple integral: \_\_\_\_\_