Student: Phong Vo **Date:** 05/04/18	**Instructor:** Chuck Ormsby **Course:** Multi-Variable and Vector Calculus -- Calculus III Spring 2018	**Assignment:** Section 15.6 Homework

1. Explain how to compute the surface integral of a scalar-valued function f over a sphere using an explicit description of the sphere.

Choose the correct answer below.

- **A.** Compute $\int_0^{2\pi}\int_0^{h} f(a\,\mathbf{cos}\,u, a\,\mathbf{sin}\,u, v)\,dv\,du$.
- **B.** Compute $\int_0^{\pi}\int_0^{2\pi} f(a\,\mathbf{sin}\,u\,\mathbf{cos}\,v, a\,\mathbf{sin}\,u\,\mathbf{sin}\,v, a\,\mathbf{cos}\,u)a^2\,\mathbf{sin}\,u\,dv\,du$.
- **C.** Compute $\int_0^{\pi}\int_0^{2\pi} f(a\,\mathbf{sin}\,u\,\mathbf{cos}\,v, a\,\mathbf{sin}\,u\,\mathbf{sin}\,v, a\,\mathbf{cos}\,u)\,dv\,du$.
- **D.** Compute $\int_0^{2\pi}\int_0^{h} f(a\,\mathbf{cos}\,u, a\,\mathbf{sin}\,u, v)a^2\,\mathbf{sin}\,u\,dv\,du$.

2. Explain how to compute a surface integral $\iint_S \mathbf{F}\cdot\mathbf{n}\,dS$ over a hemisphere using a parametric description of a hemisphere of radius a and a given orientation.

Choose the correct answer below.

- **A.** Compute $\int_0^{\frac{\pi}{2}}\int_0^{2\pi} a^2\,\mathbf{sin}\,u(f\,\mathbf{tan}\,u\,\mathbf{cos}\,v + g\,\mathbf{tan}\,u\,\mathbf{sin}\,v + h)\,dv\,du$.
- **B.** Compute $\int_0^{2\pi}\int_0^{h} a^2\,\mathbf{sin}\,u(f\,\mathbf{cos}\,u + g\,\mathbf{sin}\,u + hv)\,dv\,du$.
- **C.** Compute $\int_0^{2\pi}\int_0^{h} (f\,\mathbf{cos}\,u + g\,\mathbf{sin}\,u + hv)\,dv\,du$.
- **D.** Compute $\int_0^{\frac{\pi}{2}}\int_0^{2\pi} (f\,\mathbf{tan}\,u\,\mathbf{cos}\,v + g\,\mathbf{tan}\,u\,\mathbf{sin}\,v + h)\,dv\,du$.

3. Give a parametric description of the form $\mathbf{r}(u,v) = \langle x(u,v), y(u,v), z(u,v) \rangle$ for the frustum of the cone $z^2 = x^2 + y^2$, for $5 \le z \le 7$.

Select the correct choice below.

- **A.** $\mathbf{r}(u,v) = \langle v \cos u, v \sin u, v \rangle$, $0 \le u \le 2\pi$, $5 \le v \le 7$
- **B.** $\mathbf{r}(u,v) = \langle 7v \cos u, 5v \sin u, v \rangle$, $0 \le u \le 2\pi$, $5 \le v \le 7$
- **C.** $\mathbf{r}(u,v) = \langle 7v \cos u, 5v \sin u, v \rangle$, $0 \le u \le 2\pi$, $5 \le v \le 7$
- **D.** $\mathbf{r}(u,v) = \left\langle \frac{7v}{5} \cos u, \frac{7v}{5} \sin u, v \right\rangle$, $0 \le u \le 2\pi$, $5 \le v \le 7$
- **E.** $\mathbf{r}(u,v) = \left\langle \frac{5v}{7} \cos u, \frac{5v}{7} \sin u, v \right\rangle$, $0 \le u \le 2\pi$, $5 \le v \le 7$

4. Describe the surface with the parametric representation shown below.

$\mathbf{r}(u,v) = \langle v \cos u, v \sin u, 5v \rangle$, for $0 \le u \le 2\pi$, $0 \le v \le 1$

Select the correct choice below and fill in the answer boxes within your choice.

- **A.** The surface is a cylinder with a height of _____ and a radius of _____.
- **B.** The surface is a sphere with its center at (_____ , _____ , _____) and a radius of _____.
- **C.** The surface is a cone with height of 5 and radius of 1 at the widest point.

5. Find the area of the surface of the half cylinder $\{(r,\theta,z): r = 4, 0 \le \theta \le \pi, 0 \le z \le 6\}$ using a parametric description of the surface.

The surface area is 24π.
(Type an exact answer, using π as needed.)

6. Evaluate the surface integral $\iint_S f(x,y,z)\, dS$ using a parametric description of the surface.

$f(x,y,z) = 4x^2 + 4y^2$, where S is the hemisphere $x^2 + y^2 + z^2 = 9$, for $z \ge 0$

The value of the surface integral is _____.
(Type an exact answer, using π as needed.)

7. Find the area of the following cone using the given explicit description of the surface.

$z^2 = 9\left(x^2 + y^2\right)$, for $0 \le z \le 9$

The surface area is $9\pi\sqrt{10}$.
(Type an exact answer, using π as needed.)

8. Evaluate the surface integral $\iint_S f(x,y,z)\,dS$ using an explicit representation of the surface.

$f(x,y,z) = e^{z}$, S is the plane $z = 18 - 2x - 6y$ in the first octant.

The value of the surface integral is _____.
(Type an exact answer, using radicals as needed.)

9. Find the average temperature on that part of the plane $x + 3y + z = 7$ over the square $|x| \le 1$, $|y| \le 1$, where the temperature is given by $T(x,y,z) = e^{-z}$.

The average value is _____.
(Type an exact answer, using radicals as needed.)

10. Find the flux of the vector field $\mathbf{F} = \langle 0,0,3 \rangle$ across the slanted face of the tetrahedron $z = 1 - x - y$ in the first octant with the normal vectors pointing in the positive z-direction. You may use either an explicit or parametric description of the surface.

The flux is _____.
(Simplify your answer.)