Exam 2 Review Problems version b)

Tuesday, December 10, 2019 12:59 PM

1) Explain the fundamental geometric concept behind computation of surface area

2) A body has the shape of a 45^0 cone $z^2 = x^2 + y^2$, $0 \le z \le 2$.
the temperature in the body is $T = x^2 + 3y^2 + 5z^2$
and the thermal conductivity is $K = 2$
Find the rate at which energy crosses outward from the surface of the cone

3) Find the flux thru the portion of the plane $2x + 6y + 3z = 6$ if $\vec{F}(x,y,z) = \langle 1, -1, 1 \rangle$ in the 1st octant only. Sketch.

4.) Change to Polar and integrate:

$$\int_0^{3/\sqrt{2}} \int_{x=y}^{\sqrt{9-y^2}} \sqrt{5 + 3x^2 + 3y^2}\, dx\, dy$$

Include a sketch of the region

5.) a) Set up an integral of your choice that would give the volume of the region in #3, if integrated.

b) Can you figure the volume out w/o Calculus?

6.) Consider the plane $z = y/2 + 10$ cut by the cylinder $x^2 + y^2 = 25$.

a) Set up an integral for the resulting elliptic area

b.) determine it

c) Now consider the sides of the same

c.) Now consider the sides of the same cylinder, still capped on the top by $z = y/2 + 10$, and on the bottom by $z = 0$.

I claim you can figure out the area of the sides with no calculus. Can you?

7.) Reverse the order of integration and integrate. Include a sketch.

$$\int_0^2 \int_y^2 \frac{\sin x}{x}\, dx\, dy$$

8.) Evaluate

$$\int_0^{\pi} \int_0^{\tan^{-1}(3)} \int_0^{\sec^2\phi \sin\theta} \rho^2 \sin\phi \, d\rho \, d\phi \, d\theta$$

9.) Convert to cylindrical, integrate

$$\int_{-2}^{2} \int_{-\sqrt{4-x^2}}^{\sqrt{4-x^2}} \int_{\sqrt{x^2+y^2}}^{2} (x^2+y^2)\, dz\, dy\, dx$$

10). Explain, with a sketch included, why, in cylindrical $dV = r\, dz\, dr\, d\theta$

11) What does the image of

$$\vec{r}(s,t) = \langle s\cos t, s\sin t, t \rangle$$

s in $[3,5]$ t in $[0, 4\pi]$

look like?

changed from original version