

Instructions: Write your name and section number on your quiz. Show all work, with clear logical steps. No work/hard-to-follow work will lose points.

Problem 1. (5 points) Find the surface area of the part of the plane

$$z = 2 + 3x + 4y$$

that lies above the rectangle $[0, 5] \times [1, 4]$.

Solution. Recall that the surface area of a function $f(x, y)$ over a region D in the xy -plane is given by $\iint_D \sqrt{1 + f_x^2 + f_y^2} \, dA$. Here, $D = [0, 5] \times [1, 4]$ and $f(x, y) = 2 + 3x + 4y$. So $f_x = 3$, $f_y = 4$. Now

$$\begin{aligned} SA &= \int_1^4 \int_0^5 \sqrt{1 + 3^2 + 4^2} \, dx \, dy \\ &= \int_1^4 \int_0^5 \sqrt{26} \, dx \, dy \\ &= \sqrt{26} \int_1^4 \int_0^5 dx \, dy \\ &= \sqrt{26}(3 \cdot 5) = 15\sqrt{26} \quad \odot \end{aligned}$$

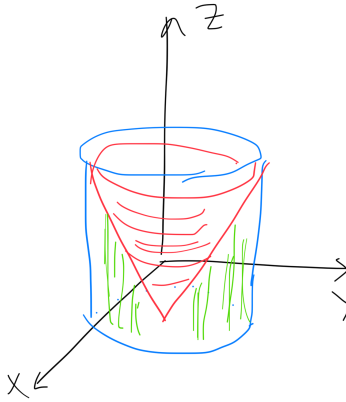
Problem 2. (10 points) Sketch the solid whose volume is given by the integral, then evaluate the integral.

$$\int_0^2 \int_0^{2\pi} \int_0^r r \, dz \, d\theta \, dr$$

Solution. Our domain of integration is

$$E = \{(r, \theta, z) \mid 0 \leq \theta \leq 2\pi, 0 \leq r \leq 2, 0 \leq z \leq r\},$$

which is the region of the cylinder $r = 2$ bounded above by the cone $z = r$ and below by the xy -plane (the green portion of the cylinder).



Evaluating the integral, we get

$$\begin{aligned}
 \int_0^2 \int_0^{2\pi} \int_0^r r \, dz \, d\theta \, dr &= \int_0^{2\pi} d\theta \left[\int_0^2 \int_0^r r \, dz \, dr \right] \\
 &= 2\pi \int_0^2 [rz]_{z=0}^{z=r} \, dr \\
 &= 2\pi \int_0^2 r^2 \, dr \\
 &= 2\pi \left. \frac{1}{3} r^3 \right|_{r=0}^{r=2} \\
 &= \frac{16}{3} \pi
 \end{aligned}$$

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Problem 3. (5 points) What is your section number?
 (11:30 = 241, 12:30 = 324, 1:30 = 338)

Problem 4. (0 points) Do you have any positive words of encouragement for your classmates?

Solution. • Keep moving forward.

- Nope.
- At least you're doing better than me.

- Just do it.
- It won't matter in the end.
- Life is too precious to constantly worry about the future. Do things one step at a time, with a fire in your soul, and everything will turn out alright.
- Pain is weakness leaving the body.
- It gets better in the end.
- Don't start to get lazy with homework and consequently not be prepared for a quiz like I just did.
- Final stretch of the semester, keep at it!
- If you fail you can take the class again.
- I think that there is a species of deer that's extinct because the female deer evolved to the point where they just refused to mate...so like, if you are having trouble finding a date...at least you know there's a chance it's not you it's them.
- Never give up, never surrender!
- Every day you wake up is a blessing. Make the most of it!
- Be careful for each step, and you're the best.
- You go to Purdue and you're a catch.
- Don't fail.
- At least there's no trig sub.
- Just keep swimming.
- No, fail to help my curve. This is the world we live in.
- If your score above the average, you pass
- You've made it this far, and you've done amazing things. Realize that you can do math in FOUR DIMENSIONS! That's nuts.

- Don't trust IU students.
- Grades are not life threatening, in a few years you will probably forget you even took this class. Also summer is very soon.

