MATH 1260 – MIDTERM #2 PRACTICE

Your Name

- You have 50 minutes to do this exam.
- No calculators!
- You may have one 3×5-card of notes
- For justifications, please use complete sentences and make sure to explain any steps which are questionable.
- Good luck!

Problem	Total Points	Score
1	-	
2	-	
3	-	
4	-	
Total	-	

1. True/False. NOTE: There are lots of True/False questions that you can read and practice on in the book. There appear in the Chapter Review at the end of Chapters 13 and 14.

(a) Every vector field is the gradient of a some scalar function.

(b) If $\mathbf{F} = \nabla f$ then div $\mathbf{F} = 0$.

(c)

$$\int_a^b \int_a^b f(x)f(y)dxdy = \left[\int_a^b f(x)\right]^2$$

(d) If $f(x,y) \geq 0$ on R and $\iint_R f(x,y)dA =$ then $f(x,y) = 0$ for all (x,y) in R.

(e) If $S = \{(x,y,z) \ : \ 1 \leq x^2 + y^2 + z^2 \leq 16\}$, then

$$\iiint_S dV = 84\pi.$$

(f) There are eight possible orders of integration for a triple iterated integral.

(g) The expression $\int_0^{\pi/2} \int_0^2 \int_{-4}^4 r \ dz \ dr \ d\theta$ represents half the volume of a cylinder of radius 2 and height 4.

(h) The vector field $\mathbf{F} = \langle ye^{x^2}, xy^2 \rangle$ is a conservative vector field.

(i) The vector field $\mathbf{F} = \langle 4x + 4y, 4x - 4y, z \rangle$ has zero curl and zero divergence everywhere.

(j) The cone $z = \sqrt{3x^2 + 3y^2}$ makes an angle of $\pi/3$ with the z-axis.

ANSWERS:	a	b	c	d	e	f	g	h	i	j

2. A) (10 Points) Calculate

$$\int_0^4 \int_0^{\sqrt{16-y^2}} (x^2+y^2)^2 015 \; dx \; dy.$$

B) (10 points) Evaluate the following triple integral compute a volume in cylindrical coordinates:

$$\int_0^{\pi^2} \int_{\sqrt{r}}^{\pi} \int_0^{\sin(\theta)/(r\theta^2)} r \; dz \; d\theta \; dr.$$

(Hint: Maybe you might want to change the order of integration when the going gets tough...)

3. A) Consider the region inside the parabolic cylinder $y = x^2$, above the xy-plane and below the plane $z = 4 - y$. Sketch the region, setup a double integral to compute its volume, and then compute its volume.

B) The parabolic cylinder and plane in part A) intersect in some curve C. The points $(-3, 9, -5)$ and $(4, 16, -12)$ both lie on C. Write down a parameterization $\mathbf{r}(t)$ that parametrizes the portion of C between these two points. Choose your parameterization so that the x coordinate increases as t increases.

4. Suppose the position of a particle at time t is given by a function

$$\mathbf{r}(t) = \langle t^2 e^{1-t}, \sin(\frac{\pi}{2}t), t + \sin(\pi t)\rangle.$$

Suppose a force field $\mathbf{F} = (y^2z^3+1)\mathbf{i}+(2xyz^3+2)\mathbf{j}+(3xy^2z^2+3)\mathbf{k}$ acts on the particle as it moves. Compute the work done by $\mathbf{F}$ on the particle as $0 \leq t \leq 1$. (Hint: Section 14.3 is useful for this problem.)