**MATH 251 Spring 2020**
**EXAM III Review Via ZOOM ID 604-163-077**
**April 6, 2020 6-8PM**

1. Let $R$ be the region in the $xy$–plane bounded by $y = 2x$, $x = 10$, and $y = -1$. Set up but do not evaluate $\iint_R (x^2 + y^2)\, dA$ in the order $dy\, dx$ and $dx\, dy$.

2. Evaluate $\int_0^3 \int_0^{\sqrt{9-x^2}} e^{-x^2-y^2}\, dy\, dx$.

3. Let $D$ be the region bounded by $y = 0$, $y = x^2$, and $x = 3$. Find $\iint_D 3x \cos y\, dA$.

4. Compute $\int_0^3 \int_{3y}^9 7e^{x^2}\, dx\, dy$.

5. Find $\iint_D \sin(4x^2 + 4y^2)\, dA$ where $D$ is the region $y \geq 0$ between the circles with center at $(0, 0)$ and radii $1$ and $3$.

6. Let $R$ be the region that lies to the left of the $y$–axis between the circles $x^2 + y^2 = 1$ and $x^2 + y^2 = 16$. Find $\int\int_R 5(x + y)$.

7. Find the volume of the sold that is above the $xy$ plane, below the ellipsoid $4x^2 + 4y^2 + z^2 = 64$ but inside the cylinder $x^2 + y^2 = 9$.

8. Let $D$ be the triangular region with vertices $(0, 1)$, $(1, 2)$, and $(4, 1)$. Set up but do not evaluate $\iint_D 7y^2\, dA$ in the order $dy\, dx$ and $dx\, dy$.

9. Let $D = \{(x, y) : 0 \leq x \leq 1, 0 \leq y \leq x^2\}$. Evaluate $\iint_D \frac{5y}{6x^5 + 1}\, dA$.

10. Let $E$ be the region bounded by $y = x^2$ and $x = y^2$ and $z = 0$ and $z = 5x + 5y$. Compute $\iiint_E 4xy\, dV$.

11. Convert to cylindrical coordinates: $\int_{-2}^{0}\int_{0}^{\sqrt{4-x^2}}\int_{\sqrt{x^2+y^2}}^{2} xz\,dz\,dy\,dx.$

12. Find the volume of the solid that is enclosed by the cylinder $x^2+y^2=9$ and the planes $y+z=12$ and $z=2$.

13. Find the volume of the solid enclosed by the paraboloids $y=x^2+z^2$ and $y=32-x^2-z^2$.

14. Express $\iiint_E f(x,y,z)\,dV$ in the order $dydzdx$ if $E$ is the solid bounded by $y=x^2$, $z=0$, $y+4z=16$.

15. Convert to Cylindrical: $\int_{-9}^{9}\int_{-\sqrt{81-y^2}}^{\sqrt{81-y^2}}\int_{\sqrt{x^2+y^2}}^{13} xz\,dz\,dx\,dy.$

16. Evaluate in spherical coordinates. $\int_{0}^{10}\int_{0}^{\sqrt{100-x^2}}\int_{\sqrt{x^2+y^2}}^{\sqrt{200-x^2-y^2}} yz\,dz\,dy\,dx$

17. Find $\iiint_E (x^2+y^2+z^2)\,dV$ where $E$ is the part of the ball centered at the origin with radius $2$ in the first octant.

18. Let $E$ be the region that lies between the spheres $x^2+y^2+z^2=1$ and $x^2+y^2+z^2=9$. Set up but do not evaluate $\iiint_E (x+y+z)\,dV$ in spherical coordinates.

19. Find the volume of the solid that lies within the sphere $x^2+y^2+z^2=4$, above the $xy$ plane and below the cone $z=\sqrt{x^2+y^2}$.