TEXAS A&M UNIVERSITY
Math Learning Center

Math 251 - Fall 2024
"Hands On Grades Up"
Exam 2 Review
Thursday, Oct 24 and
Thursday, October 31,
6:30-8:30 PM
ZACH 340/353

Exam 3 Review: Covering sections 15.1-15.3, 15.6-15.9

PLEASE SCAN THE QR CODE BELOW

We will begin at 6:30 PM. A problem will be displayed on the wall monitors. Collaborate with your table on how to solve each problem. If you have a question, raise your hand. At the end of a predetermined number of minutes, the solutions will be displayed on the table monitors. Feel free to take a picture of the solution, as the solutions are not posted.

Problem 1. Let $D = \{(x, y) : 0 \leq x \leq 1, 0 \leq y \leq x^2\}$. Evaluate $\iint_D \frac{5y}{6x^5 + 1}\, dA$ by first sketching the region of integration the xy-plane.

Problem 2. Evaluate $\int_{-3}^{0}\int_{-\sqrt{9-y^2}}^{0}\left(e^{-x^2-y^2}\right)\,dx\,dy$ by first sketching the region of integration the xy-plane.

Problem 3. Let D be the region bounded by $y = x^3$, $y = 8$, and $x = 0$. Find $\iint_D x^2 \sin y \, dA$ by first sketching the region D in the xy-plane..

Problem 4. Consider $\int_0^3 \int_{3y}^9 e^{x^2}\, dx\, dy$. Sketch the region of integration and evaluate the integral by reversing the order of integration.

Problem 5. Evaluate $\iint_R y\,dA$, where R is the region in the first quadrant enclosed by the by the circle $x^2 + y^2 = 9$ and the lines $y = 0$ and $y = \sqrt{3}x$.

Problem 6. Find the volume of the solid enclosed by the sphere $4x^2 + 4y^2 + 4z^2 = 64$ and the cylinder $x^2 + y^2 = 9$.

Problem 7. Consider $\iint_R f(x,y)\,dA$, where R is the region bounded by $y = x - 2$ and $y^2 = x$. By sketching the region R:

a.) Set up the corresponding double integral in the order $dx\,dy$.

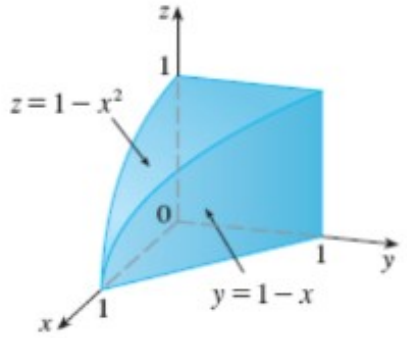
b.) Set up the corresponding double integral in the order $dy\,dx$.

Problem 8. Convert from rectangular to spherical:

a.) $(-1, \sqrt{3}, -2)$

b.) $(0, -2, 0)$

Problem 9. Write the integral $\iiint_E f(x, y, z)\, dV$ in the order $dzdxdy$, where E is the region in the first octant bounded by $z = 1 - x^2$ and $y = 1 - x$ (see below). Your solution should include the projection of E onto the xy-plane.



Problem 10. Find the volume of the solid that is enclosed by the cylinder $x^2 + y^2 = 9$ and the planes $y + z = 12$ and $z = 2$.

Problem 11. Find the volume of the solid enclosed by the paraboloids $y = x^2 + z^2$ and $y = 32 - x^2 - z^2$.

Problem 12. Convert to Cylindrical: $\int_{-9}^{0}\int_{-\sqrt{81-y^2}}^{\sqrt{81-y^2}}\int_{\sqrt{x^2+y^2}}^{13} xz\,dz\,dx\,dy$. Do not evaluate the integral.

Problem 13. 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.

Problem 14. Evaluate in spherical coordinates. $\displaystyle\int_0^{10}\int_0^{\sqrt{100-x^2}}\int_{\sqrt{x^2+y^2}}^{\sqrt{200-x^2-y^2}} yz\,dz\,dy\,dx$

Problem 15. 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 $z = \sqrt{x^2 + y^2}$.

Problem 16. Use the change of variables $x = u - v$, $y = 2u + 3v$ to evaluate $\iint_R (2x + y)\, dA$, where R is the region bounded by $y = 2x$, $y = 2x + 10$, $y = -3x$, $y = -3x + 15$.