TEXAS A&M UNIVERSITY
Math Learning Center

Math 152 - Spring 2024
Exam 1 Review
"Hands On Grades Up"
Monday, Feb 12, 6-8 PM
ZACH 442/440

PLEASE SCAN THE QR CODE BELOW

We will begin at 6PM. A problem will be displayed on the table 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 wall monitors. Feel free to take a picture of the solution, as the solutions are not posted. Be sure you write clearly in the free response questions, and justify each step with well written mathematics to avoid losing partial credit!

Problem 1. Find $\displaystyle\int \frac{x+2}{\sqrt{1-x^2}}\,dx$.

Problem 2. Evaluate $\displaystyle\int_0^5 \frac{x}{\sqrt{x+4}}\,dx$.

Problem 3. Find $\int \frac{x}{e^{2x}}\,dx$.

Problem 4. Evaluate $\int_1^e x \ln x \, dx$.

Problem 5. After performing one iteration of integration by parts, rewrite $\int x^2 \arctan(9x^2)\, dx$.

Problem 6. Consider the region R bounded by $x = 3y - y^2$ and $y = -\frac{x}{2}$. Find the intersection points of the two curves. Set up but do not evaluate an integral that gives the area of R.

Problem 7. Find the area bounded by $y = \cos x$, $y = 0$, $x = \dfrac{\pi}{4}$ and $x = \pi$.

Problem 8. Consider the region R bounded by $x = -(y-3)^2$ and $x = -4$. Set up but do not evaluate the integral that gives the volume obtained by rotating R about the x-axis.

Problem 9. Consider the region R bounded by $y = 2x^2 - 4x$ and $x = \dfrac{y}{2}$. Find the points of intersection of the curves and sketch the region R.

a.) Set up but do not evaluate an integral that gives the volume of the solid obtained by rotating R about y axis.

Problem 9 (continued).

b.) Consider the region R bounded by $y = 2x^2 - 4x$ and $x = \dfrac{y}{2}$. Set up but do not evaluate an integral that gives the volume of the solid obtained by rotating R about the line $y = 7$.

Problem 10. Consider the region R bounded by $y = \sin x$, $y = 0$, and $x = \dfrac{\pi}{2}$. Find the volume of the solid obtained by rotating R about the line $x = \dfrac{\pi}{2}$.

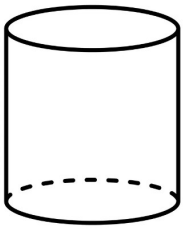
Problem 11. Consider the solid S whose base is the triangular region with vertices $(1, 1)$, $(2, 2)$ and $(3, 1)$. Cross-sections of S perpendicular to the y-axis isosceles triangles with height equal to the base. Set up but do not evalate an integral that gives the volume of S.

Problem 12. A spring has a natral length of 1 m. The force required to hold the spring to 3 m is 5 N. Find the work done in stretching the spring from 2 m to 4 m.

Problem 13. A spring has a natural length of 8 inches. If the work required to stretch the spring from 1 foot to 2 feet is 10 foot pounds, find the force required to hold the spring to 4 feet.

Problem 14. A rope that weighs 200 N and is 40 meters long hangs vertically from the top of a tall building. At the end of the rope, there is a 10 N weight attached. How much work is done in pulling the top 5 meters of the rope to the top of the building?

Problem 15. A tank is in the shape of an upright cylinder with radius 10 feet and height 500 feet. If the tank is initially full to a depth of 200 feet, set up but do not evaluate an integral that gives the work required to pump the water to the top of the tank. Note: The weight density of water is $\rho g = 62.5$ pounds per cubic foot. **Your solution must contain a vertical axis, indicating which direction is positive**.



Problem 16. A tank contains water and has the shape of a trough 40 m long. The end of the trough is an isosceles triangle with height 5 m and a length of 2 m across the top, as shown below. Set up but do not evaluate an integral that gives the work required to pump the top 3 m of water through a 1 m high spout located at the top of the tank. The weight density of water is $\rho g = 9800$ Newtons per cubic meter. **Your solution must contain a vertical axis, indicating which direction is positive**.