Math 12-6 (10:30 AM)—Spring, 2025 Midterm III (45 minutes)
D.C. Smolarski, S.J. Friday, May 16, 2025

NOTES:

1. Problems can be written in the green book IN ANY ORDER, but please START each problem on a NEW PAGE (EITHER side) and label it properly.
2. PLEASE *label* (or underline or box in) all ANSWERS clearly.
3. **NO CALCULATORS!**

$\Longrightarrow$ NOTE: PROBLEMS 1 AND 2 INVOLVE THE TRIANGLE (CALL IT A) FORMED BY THE LINES $y = x/3$, $x = 3$ AND $y = 2$. *You should* SKETCH *this triangle, and the appropriate figures of revolution and* INDICATE *the quantities necessary for finding the volumes, e.g.,* RADIUS *(radii) and* HEIGHT.

1. (15) Rotate triangle A around the line $y = 1$ to generate a solid. Set up (but do *not* integrate) the integral needed to find the volume of this solid via the method of *washers* or *disks*.

2. (15) Rotate triangle A around the y-axis to generate a solid. Set up (but do *not* integrate) the integral needed to find the volume of this solid via the method of *cylindrical shells*.

3. (12) Find the distance along the curve $y = \frac{2}{3}x^{3/2} - \frac{1}{2}x^{1/2}$ from $x = 0$ to $x = 4$.

4. (12) Evaluate: $\int x^3 e^{x^2} dx$

5. (12) Evaluate: $\int x \sin 2x dx$

6. (12) Evaluate: $\int \frac{x^3}{1+x^4} dx$

7. (12) Evaluate: $\int \frac{x}{1+x^4} dx$

8. (10) Solve $\frac{dy}{dx} = \frac{y^3}{x}$, given $x = 1$ and $y = 2$. (Note: you do NOT have to refine the solution to a form where y is alone on one side of an equation.)