

University of Pennsylvania
Math 104 Section 3
Fall 2016

Name: _____

Penn ID#: _____

Midterm Examination #1

This exam contains eight questions. No calculators are allowed, but you may use one standard sized 8.5"x11" sheet with notes handwritten on both sides. Show your work in the space provided below, and circle your final answer. Little or no credit will be given for an answer with no supporting work, even if correct. If you change an answer, please either erase or cross out the answer you do not want to be considered.

My signature below certifies that I have complied with the University of Pennsylvania's Code of Academic Integrity in completing this examination. In particular, all the work on this test is my own.

Signature

1. Find the volume of a pyramid whose base is a square with side L and whose height is h .

(A) $\frac{L^2 h^2}{3}$

(B) $\frac{L^2 h^2}{9}$

(C) $\frac{L^2}{6h}$

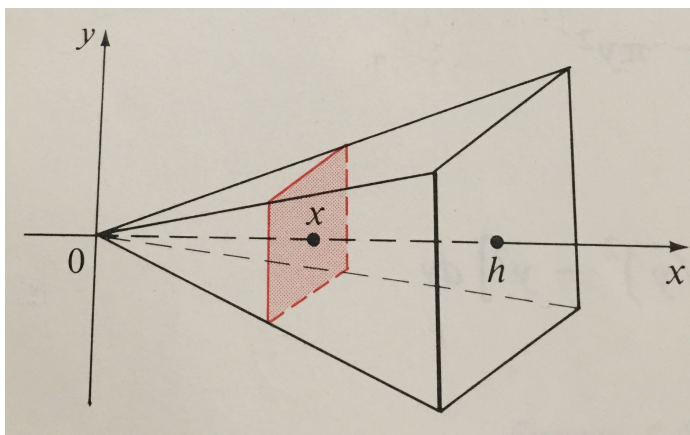
(D) $\frac{L^2}{3h^2}$

(E) $\frac{L^2 h}{9}$

(F) $\frac{L^2}{9h}$

(G) $\frac{L^2 h^2}{18}$

(H) $\frac{L^2 h}{3}$



2. Find the volume of revolution of the solid generated by revolving the region bounded by the graphs of $y = e^x$, $y = 0$, $x = 0$, and $x = 2$ about the x -axis.

(A) $2\pi(e^4 - 1)$ (B) $\frac{\pi}{2}(e^4 - 1)$ (C) $\frac{\pi}{4}(e^2 - 1)$ (D) $\frac{\pi}{2}e^4$
(E) $\frac{\pi}{2}e^2$ (F) $\frac{\pi}{4}(e^4 - 2)$ (G) $2\pi(e^2 - 1)$ (H) $\frac{\pi}{2}(e^2 - 1)$

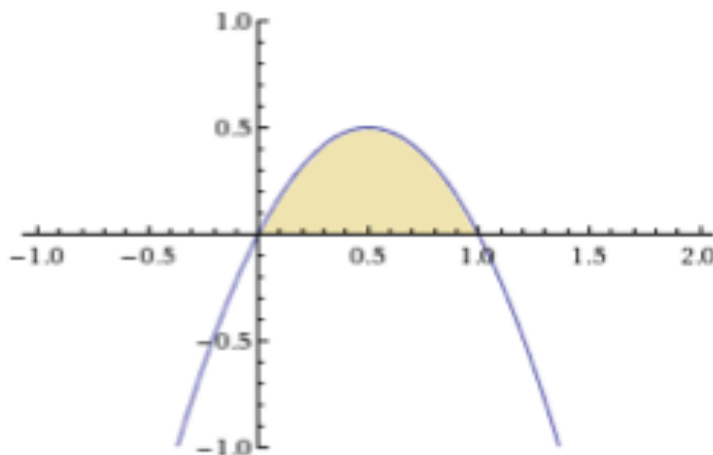
3. Find the volume of the solid generated by revolving the region under the graph of f about the x -axis with

$$f(x) = \begin{cases} \frac{1}{2} & 0 \leq x < 1 \\ x^2 - 2x + 2 & 1 \leq x \leq 2 \end{cases}$$

(A) $\frac{127\pi}{60}$ (B) $\frac{63\pi}{30}$ (C) $\frac{3\pi}{2}$ (D) $\frac{160\pi}{3}$
(E) $\frac{67\pi}{30}$ (F) $\frac{16\pi}{3}$ (G) $\frac{127\pi}{30}$ (H) $\frac{2\pi}{60}$

4. Find the volume of the solid generated by revolving the region bounded above by the graph of $y = 2x - 2x^2$ and below by the x -axis about the line $x = 2$.

- (A) $\frac{\pi}{3}$ (B) $\frac{\pi}{2}$
 (C) π (D) $\frac{1}{6}$
 (E) $\frac{1}{3}$ (F) $\frac{\pi}{6}$
 (G) 2 (H) 2π



5. Find the arc length of the curve $y = \frac{2\sqrt{3}}{9}(3x^2 + 1)^{\frac{3}{2}}$ from $x = -1$ to $x = 2$.

- (A) 13 (B) 3 (C) π (D) 18
 (E) 21 (F) $\frac{1}{9}$ (G) 6 (H) 9

6. Find the area of the surface obtained by rotating the curve $y^2 = 4x + 4$, $0 \leq x \leq 8$ about the x -axis.

(A) $\frac{8\pi}{3}(10\sqrt{5} - 2\sqrt{2})$	(B) $\frac{4\pi}{3}(10\sqrt{10} - \sqrt{2})$
(C) $\frac{8\pi}{6}(10\sqrt{10} - \sqrt{2})$	(D) $\frac{8\pi}{3}(20\sqrt{5} - 2\sqrt{2})$
(E) $\frac{4\pi}{3}(10\sqrt{5} - 2\sqrt{2})$	(F) $\frac{8\pi}{3}(10\sqrt{10} - 2\sqrt{2})$

7. Find the area of the region bounded by the curves $y = \sin x$ and $y = \cos x$ between $x = 0$ and $x = \frac{\pi}{2}$. Remember that area is always non-negative.

(A) $\frac{1}{2}(\sqrt{2} - 1)$	(B) $\frac{1}{2}\sqrt{2} - 1$	(C) $\frac{\pi}{2}$
(D) 0	(E) $2\sqrt{2} - 2$	(F) $\frac{\pi}{4}$

8. Find the y -coordinate of the center of mass for the following flat thin plate with constant density ($\delta = 5$).

(A) $\frac{-20}{3(\pi+8)}$

(B) 0

(C) $\frac{5(\pi+8)}{2}$

(D) $-\frac{50}{3}$

(E) $\frac{20}{3(\pi+8)}$

(F) $\frac{-4}{3(\pi+8)}$

(G) $-\frac{10}{3}$

(H) $-\frac{5(\pi+8)}{2}$

