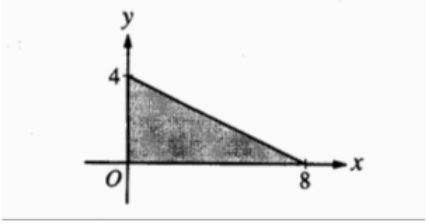
APAB S.Hogan
Chapter 6/7 Review

The Chapter 6/7 Exam will consist of a calculator required section (one free-response and four multiple-choice) and a non-calculator section (one free-response and four multiple-choice.)
PART 1: Graphing calculator required. (25 minutes)

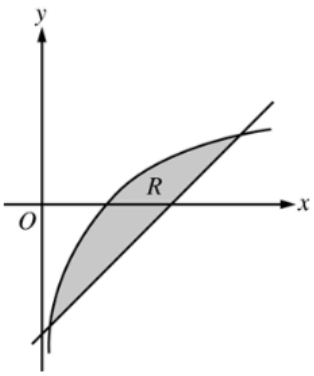
MC1 Calc	When the region enclosed by the graphs of $y = x$ and $y = 4x - x^2$ is revolved about the y-axis, the volume of the solid generated is given by (A) $\pi\int_0^3 \left(x^3 - 3x^2\right)dx$ (B) $\pi\int_0^3 \left(x^2 - \left(4x - x^2\right)^2\right)dx$ (C) $\pi\int_0^3 \left(3x - x^2\right)^2 dx$ (D) $2\pi\int_0^3 \left(x^3 - 3x^2\right)dx$ (E) $2\pi\int_0^3 \left(3x^2 - x^3\right)dx$
MC2 Calc	Population y grows according to the equation $\frac{dy}{dt} = ky$, where k is a constant and t is measured in years. If the population doubles every 10 years, then the value of k is (A) 0.069 (B) 0.200 (C) 0.301 (D) 3.322 (E) 5.000
MC3 Calc	 The base of a solid is a region in the first quadrant bounded by the x-axis, the y-axis, and the line $x + 2y = 8$, as shown in the figure above. If cross sections of the solid perpendicular to the x-axis are semicircles, what is the volume of the solid? (A) 12.566 (B) 14.661 (C) 16.755 (D) 67.021 (E) 134.041

MC4 Calc

If $0 \le k < \frac{\pi}{2}$ and the area under the curve $y = \cos x$ from $x = k$ to $x = \frac{\pi}{2}$ is 0.1, then $k =$

(A) 1.471 (B) 1.414 (C) 1.277 (D) 1.120 (E) 0.436

FR5 Calc



Let R be the shaded region bounded by the graph of $y = \ln x$ and the line $y = x - 2$, as shown above.

(a) Find the area of R.

(b) Find the volume of the solid generated when R is rotated about the horizontal line $y = -3$.

(c) Write, but do not evaluate, an integral expression that can be used to find the volume of the solid generated when R is rotated about the y-axis.

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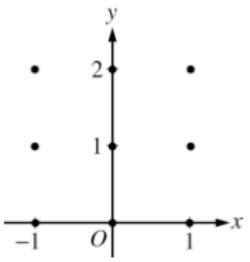
PART 2: NO CALCULATOR (23 minutes)

FR6 Non-Calc

Consider the differential equation $\frac{dy}{dx} = \frac{1}{2}x + y - 1$.

(a) On the axes provided, sketch a slope field for the given differential equation at the nine points indicated.
(Note: Use the axes provided in the exam booklet.)



(b) Find $\frac{d^2y}{dx^2}$ in terms of x and y. Describe the region in the xy-plane in which all solution curves to the differential equation are concave up.

(c) Let $y = f(x)$ be a particular solution to the differential equation with the initial condition $f(0) = 1$. Does f have a relative minimum, a relative maximum, or neither at $x = 0$? Justify your answer.

(d) Find the values of the constants m and b, for which $y = mx + b$ is a solution to the differential equation.

MC7 Non-Calc

What is the volume of the solid generated by rotating about the x-axis the region enclosed by the curve $y = \sec x$ and the lines $x = 0$, $y = 0$, and $x = \frac{\pi}{3}$?

(A) $\frac{\pi}{\sqrt{3}}$

(B) π

(C) $\pi\sqrt{3}$

(D) $\frac{8\pi}{3}$

(E) $\pi \ln\left(\frac{1}{2} + \sqrt{3}\right)$

MC8 Non-Calc

The region R in the first quadrant is enclosed by the lines $x=0$ and $y=5$ and the graph of $y=x^2+1$. The volume of the solid generated when R is revolved about the y-axis is

(A) 6π (B) 8π (C) $\frac{34\pi}{3}$ (D) 16π (E) $\frac{544\pi}{15}$

MC9 Non-Calc

The base of a solid is the region enclosed by the graph of $y=e^{-x}$, the coordinate axes, and the line $x=3$. If all plane cross sections perpendicular to the x-axis are squares, then its volume is

(A) $\frac{\left(1-e^{-6}\right)}{2}$ (B) $\frac{1}{2}e^{-6}$ (C) e^{-6} (D) e^{-3} (E) $1-e^{-3}$

MC10 Non-Calc

Let R be the region in the first quadrant enclosed by the graph of $y=(x+1)^{\frac{1}{3}}$, the line $x=7$, the x-axis, and the y-axis. The volume of the solid generated when R is revolved about the y-axis is given by

(A) $\pi\int_0^7 (x+1)^{\frac{2}{3}}\,dx$ (B) $2\pi\int_0^7 x(x+1)^{\frac{1}{3}}\,dx$ (C) $\pi\int_0^2 (x+1)^{\frac{2}{3}}\,dx$

(D) $2\pi\int_0^2 x(x+1)^{\frac{1}{3}}\,dx$ (E) $\pi\int_0^7 (y^3-1)^2\,dy$