

MATH 1242
COMMON FINAL EXAMINATION
FREE RESPONSE SECTION
FALL, 1997

This exam is divided into two parts. These pages contain Part II which consists of 6 free response questions.

Please show all of your work on the problem. We will not grade loose paper.

- If you are basing your answer on a graph on your calculator, sketch a picture of your graph on your sheet and be sure to label your window.
- **Make sure that your name appears on each page.**
- The table of integrals from the text appears at the end of this examination booklet. You may find these useful.

At the end of the examination you **MUST** hand in this test booklet and all scratch paper.

PROBLEM	1	2	3	4	5	6
GRADE						

FREE RESPONSE SCORE: _____

Name: _____ Student No: _____

Instructor: _____ Section No: _____

1.

(a) Find the indefinite integral $\int \frac{1}{(2-t)^2} dt$.(b) Sketch the graph of the integrand $f(t) = \frac{1}{(2-t)^2}$.(c) Find the domain of $f(t)$.(d) Evaluate the improper integral $\int_3^\infty \frac{1}{(2-t)^2} dt$ if it exists.(e) Evaluate the improper integral $\int_2^3 \frac{1}{(2-t)^2} dt$ if it exists.2. The function $f(x)$ has values given in the table below.

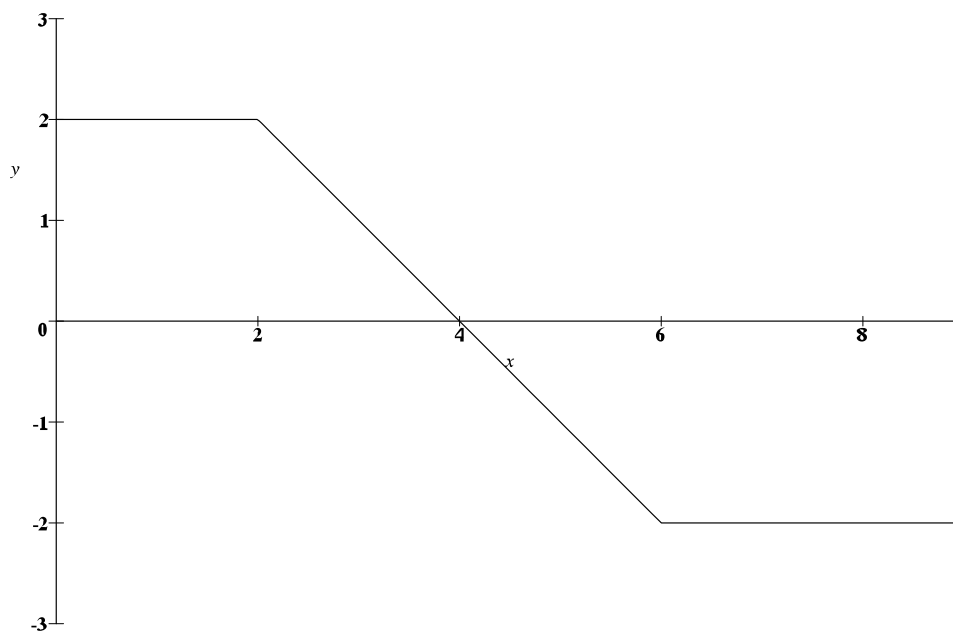
x	0	0.2	0.4	0.6	0.8	1.0
$f(x)$	1	1.199	1.261	1.254	1.216	1.170

1. Approximate $\int_0^1 f(x) dx$ using the right hand sum.2. Approximate $\int_0^1 f(x) dx$ using the left hand sum.3. Approximate $\int_0^1 f(x) dx$ using the trapezoidal sum.

	Right Sum	Left Sum	Trapezoidal
$\int_0^1 f(x) dx$			

(Show your work!)

3. The graph of the derivative f' is shown in the following figure.Assume $f(0) = -1$.



- (a) Find $f(2)$, $f(4)$, $f(6)$, and $f(8)$.

$f(2)$	$f(4)$	$f(6)$	$f(8)$

- (b) Identify the form of f on each of the following intervals by placing a check in the appropriate box.

Interval	Constant	Linear	Quadratic	Cubic
$(0, 2)$				
$(2, 4)$				
$(4, 6)$				
$(6, 8)$				

- (c) Sketch the graph of $f(x)$ on the given axes above.

4.

- (a) Sketch the graph of $y = -\sin(x) + 2$ from $x = -\pi$ to $x = \pi$.
- (b) Shade in the region bounded by this curve, the x -axis, $x = 0$ and $x = \pi$.
- (c) Set up the integral that represents the volume of the solid obtained by rotating the region about the x -axis.

5. Find the following antiderivatives. Show your work!

(a) $\int x^2 e^{3x} dx.$

(b) $\int \frac{x}{(1+x^2)^3} dx.$

(c) $\int \frac{t}{(t+3)^2} dt.$

6. An anticoagulant drug is prescribed for a patient. After stopping administration of the drug, the quantity remaining in the patient's body decreases at a rate proportional to the quantity remaining. The half-life of the drug is 12 hours.

- (a) Sketch a rough graph of the quantity Q of the drug in the patient's body as a function of time t . Assume that 200 mg of the drug is present at time $t = 0$. Label the points on your graph where $t = 0$, $t = 12$, $t = 24$, and $t = 36$.
- (b) Write a differential equation satisfied by Q , including the initial conditions.
- (c) How many hours does it take for the drug level to be reduced to 10% of the original level?