

MATH 1241
COMMON FINAL EXAMINATION
FREE RESPONSE SECTION
SPRING, 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.**

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

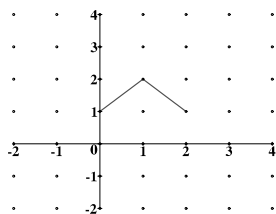
PROBLEM	1	2	3	4	5	6
GRADE						

FREE RESPONSE SCORE: _____

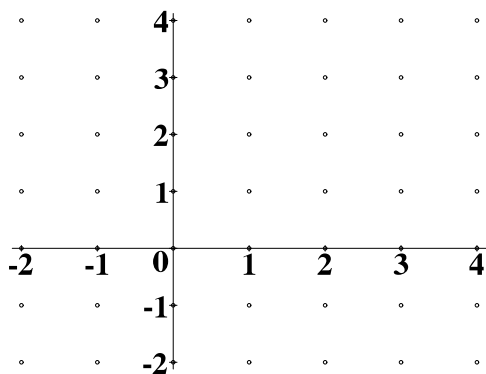
Name: _____ Student No: _____

Instructor: _____ Section No: _____

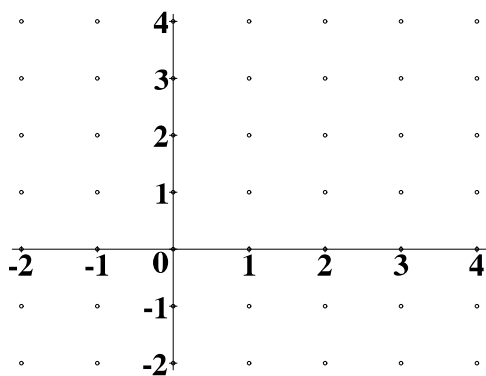
1. Consider the function $f(x)$ described by the graph below:



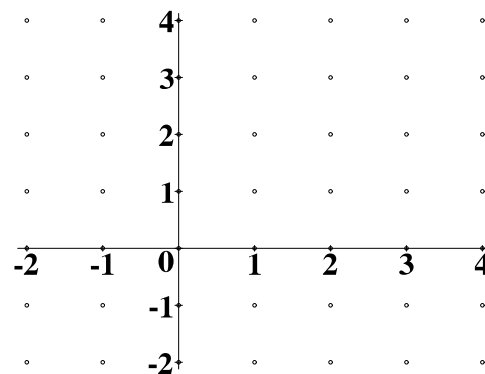
Sketch the following functions. Add grid points where needed.



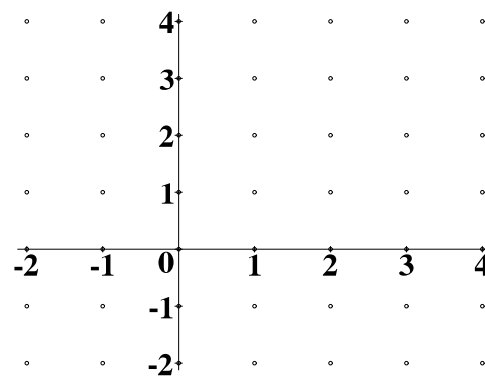
(a) $f(x + 1)$



(c) $f(x) - 2$



(b) $-\frac{1}{2}f(x)$



(d) $-\frac{1}{2}f(x + 1) - 1$

2. Let $f(x)$ be the function defined by $f(x) = \sqrt{x^2 + 9}$.
- (a) Write an equation for the line tangent to the graph of $f(x)$ at $x = 4$.
- (b) Use the tangent line approximation to $f(x)$ at $x = 4$ to approximate $f(5)$. Determine the error of your approximation
3. Consider the function $f(x) = 2 - x$. Find the point on the graph of f which is closest to the origin. Clearly show your setup and how you worked the problem out.
4. Consider the function defined implicitly near $(2, 1)$ by

$$x^2y^2 + 3xy = 10y.$$

- (a) Use implicit differentiation to find the derivative at $(2, 1)$.
- (b) Determine the equation of the tangent line at $(2, 1)$.
5. Consider the following table of values from a smooth function f :

x	6.5	7.0	7.5	8.0	8.5	9.0
$f(x)$	10.3	8.2	6.5	5.2	4.1	3.2

- (a) Use a numerical method to get an estimate of $f'(7)$.
- (b) Determine accurate upper and lower bounds for $\int_7^9 f(x) dx$.

6. Compute the derivatives of the following functions. You do not need to simplify.
No partial credit.

(a) $f(x) = \frac{x^2 + 1}{\sin(2x)}$.

(b) $f(x) = \sin(2x) \cdot e^{x^2}$.

(c) $f(x) = \arctan(\sqrt{x})$.

(d) $f(x) = e^{\sqrt{x^2+1}}$.

(e) $f(x) = (4x^2 - 1)^3(8x + 9)^{11}$.