

MATH 120A
Exam 1
Version 1
April 24, 2003

Name _____

Section _____

1	8	
2	14	
3	14	
4	14	
Total	50	

- You are allowed to use a calculator and one sheet of hand-written notes.
- Check that your exam contains four questions.
- Show all your work and clearly indicate your final answer.
- When rounding is necessary, unless otherwise instructed, you may round your **final answer** to two digits after the decimal.
- If you use a trial-and-error or guess-and-check method to solve a problem when an algebraic method is available, you will not receive full credit.
- Give answers with appropriate units.
- Raise your hand if you have a question.
- You have 50 minutes to complete the exam.
- Please put your name on your sheet of notes and turn it in with the exam.

GOOD LUCK!

1. (8 points)

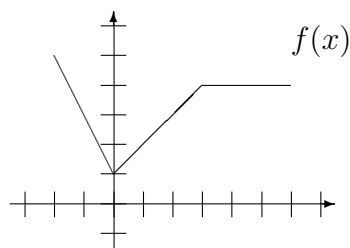
(a) Let $f(x) = 3x^3 - 4x^2 + x$. Compute and simplify $\frac{f(2a) - f(a)}{a}$.

(b) Find the equation of the line that passes through the point $(7, 5)$ and whose y -intercept is 13.

2. (14 points)

Let $f(x)$ be the multi-part function defined by

$$f(x) = \begin{cases} -2x + 1, & \text{if } -2 \leq x \leq 0 \\ x + 1, & \text{if } 0 \leq x \leq 3 \\ 4, & \text{if } 3 \leq x \leq 6 \end{cases}$$



The graph of $f(x)$ is given at right.

(a) Give the domain and range of $f(x)$.

(b) Find all values of x for which $f(x) = \frac{3}{2}$.

(c) Find the domain of the function $g(x) = \sqrt{\frac{3}{2} - f(x)}$.

(d) Find the domain and range of the function $h(x) = 3f(\frac{1}{2}(x - 5)) + 7$.

3. (14 points) A small airplane is flying slowly near a local airport. The plane is currently 3 miles south and 4 miles east of the airport. The plane flies in a straight line so that, in 10 minutes, it will be 5 miles north and 1 mile west of the airport. The airport has a radar system that detects planes within a 3-mile radius of the airport.
- (a) Impose a coordinate system with the airport at the origin. Clearly indicate the coordinates of the current location of the plane, the coordinates of the plane's location 10 minutes from now, and the boundary of the radar zone.
- (b) Give the speed of the plane in miles per hour.
- (c) Give the location of the plane (its x - and y -coordinates) when the airport first detects it by radar.

4. (14 points) A 25-year study of the student population of the Pine Valley School District has just been completed. The total student population in year t is modelled by the quadratic function

$$T(t) = -5t^2 + 112t + 2024.$$

Further, the study indicates that the female student population is given by a *linear* function. At the start of the study ($t = 0$), the female student population is 1070; at the end of the study ($t = 25$), the female population is 820.

- (a) According to the quadratic model for total student population, what is the maximum total student population? (Round your **final answer** to the nearest whole number of students.)
- (b) Find a linear model $F(t)$ that gives the female student population in year t .
- (c) Compute the male student population in year 14.
- (d) Give the longest interval of time over which the male student population is increasing.