

MAT 194 Final Exam Spring 2005

May 9, 2005

Do not open this booklet until you are told to do so. Show all work required to solve the problems. Incorrect answers not supported by work will receive **no** partial credit. You may use a calculator on any part of the exam, but you may not share a calculator with another student. If you have any questions, ask one of the proctors.

Name: _____

Signature: _____

Instructor's Name (circle one): Fisher Masingila Waldron

(Do not write below this line)

Page 1 _____ points (out of 10)

Page 2 _____ points (out of 16)

Page 3 _____ points (out of 22)

Page 4 _____ points (out of 20)

Page 5 _____ points (out of 16)

Page 6 _____ points (out of 16)

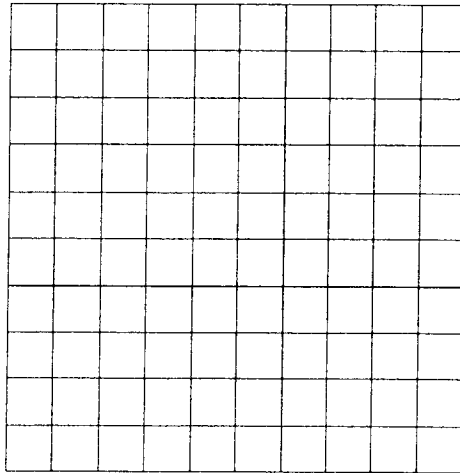
TOTAL _____ **points (out of 100)**

2. a. (4 pts) Suppose that $f(x)$ is linear and that $f(-2) = 3$ and $f(6) = -1$. Find a formula for f .

b. (4 pts) Suppose that $g(x)$ is the line perpendicular to $f(x)$ with y-intercept = 1. Find a formula for g .

3. For the piecewise defined function $f(x) = \begin{cases} 1 & -2 \leq x < -1 \\ x^2 & 0 \leq x < 2 \\ x & 2 \leq x < 4 \end{cases}$

a. (4 pts) Graph $f(x)$.



b. (2 pts) Determine the domain of $f(x)$.

c. (2 pts) Determine the range of $f(x)$.

4. Neighbors A and B both go to enjoy their pools at noon the same day. Each holds 12,000 gallons of water when filled to capacity. The amount of water in Pool A t hours after noon is given by $A(t) = 6000(1.097)^t$. Pool B, initially filled to capacity, immediately begins leaking water at a rate of 4.2% per hour.
- (2 pts) Is water being added to or leaking from Pool A? At what rate?
 - (4 pts) Find a formula $B(t)$ for the amount of water in Pool B t hours after noon.
 - (2 pts) How much water does each pool contain at 2:30pm? [Round to the nearest gallon.]
 - (6 pts) How long will it take to completely fill Pool A? [Round to the nearest tenth.]
 - (8 pts) When will the pools contain the same amount of water? [Round to the nearest hour.]

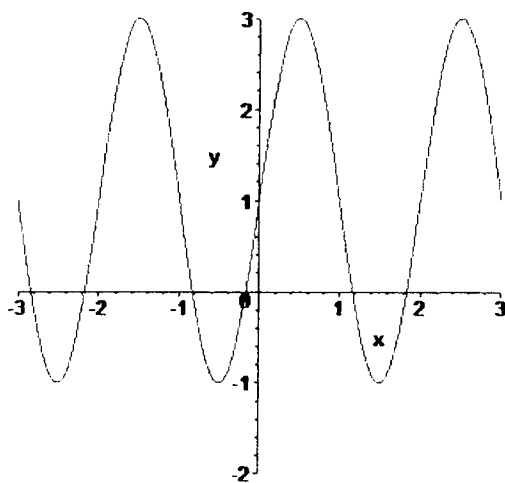
5. (8 pts) The population of a certain insect is decreasing exponentially according to the formula $P(t) = 5000e^{-0.22t}$, where t is in years. Determine the half-life of the population. [Round to the nearest hundredth].

6. a. (4 pts) How is the function $f(x) = -2(x + 4)^2 + 18$ related to $y = x^2$ (in terms of shifts, stretches, compressions, etc.)?

- b. (2 pts) What is the vertex of $f(x)$?

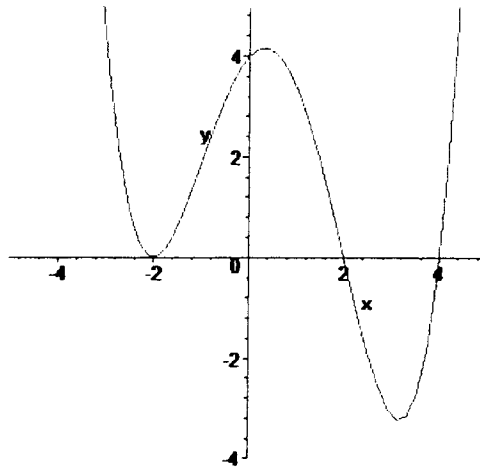
- c. (6 pts) Determine the zeros of $f(x)$.

7. (8 pts) Find a formula for the trigonometric function below.



8. Let $f(x) = 2x^2 + 1$ and $g(x) = 3 - 2x$.
- a. (4 pts) Find $f(g(x))$ and simplify your answer.
- b. (4 pts) Find $g(f(x))$ and simplify your answer.

9. (8 pts) Find a formula for the polynomial function below.



10. (8 pts) Give a possible formula for a rational function with zeros at $x = -1$ and $x = 3$, vertical asymptotes at $x = -4$ and $x = 2$, and a horizontal asymptote of $y = 5$.