

Your Name (please print): _____

Student I.D. # _____

Quiz Section (time) _____ TA's Name _____

- You will have 50 minutes for this exam.
- The exam is closed book but you are allowed one $8\frac{1}{2}'' \times 11''$ page of notes (both sides) in your own handwriting.
- Graphing calculators are not allowed.
- You **must show your** work in order to receive credit. Do not do computations in your head. Instead, write them out on the exam paper.
- Place a box around **YOUR FINAL ANSWER** to each question.
- If you need more room, use the backs of the pages and indicate that you have done so.
- Raise your hand if you have a question.

SCORE

1.	(15)	
2.	(12)	
3.	(14)	
4.	(14)	
Total	(55)	

Problem #4 contains a question for extra credit, worth 5 points. Getting 50 points is enough for full credit (100%).

Good Luck!

1 (15 points total) At time $t = 0$ seconds a mouse is located 2 feet West and 3 feet North of a cat. The cat is not moving, but the mouse is running along a straight line with a constant speed, so that after 2 seconds it is located 6 feet East and 1 foot South of the cat.

- (a) (3 pts) Find the speed of the mouse.
- (b) (2 pts) Find the equation of the path of the mouse.
- (c) (5 pts) Find the equation of the line through the cat perpendicular to the path of the mouse. Where does this line intersect the path of the mouse?
- (d) (5 pts) When does the mouse reach the location closest to the cat?

2 (12 pts total) Gertrude makes and sells toothbrushes and is trying out different prices. During the first month she charges \$3 per toothbrush and sells 100 of them. During the second month she charges \$3.50 per toothbrush and sells only 50.

(a) (4 pts) Find the number of toothbrushes sold as a function of price, assuming that it is given by a linear function.

(b) (8 pts) The cost of making a toothbrush is \$1. What price should Gertrude charge to maximize her profit? What will be the profit and how many toothbrushes will she sell?

3 (14 pts total) Above you see the graph of a function $y = f(x)$, consisting of a straight line segment and a quarter circle.

(a) (6 pts) Find a multipart formula for $f(x)$.

(b) (4 pts) Draw the graph of $y = -\frac{1}{2}f(2x)$. Indicate which graphical maneuvers you did.

(c) (4 pts) Draw the graph of $y = f(x + 2) + 2$. Indicate which graphical maneuvers you did.

4 (14 points total) Consider the functions

$$f(x) = \sqrt{1 - x - x^2}, \quad g(x) = x + 2, \quad h(x) = 3x.$$

- (a) (4 pts) Write down formulas for the compositions $f(g(h(x)))$ and $h(g(f(x)))$ (don't simplify).
- (b) (5 pts) Find the domain of $f(x)$.
- (c)* (5 pts of extra credit) Find the range of $f(x)$.