Fall '05/MAT 150/Exam 2 **Name:** *Show all your work.*

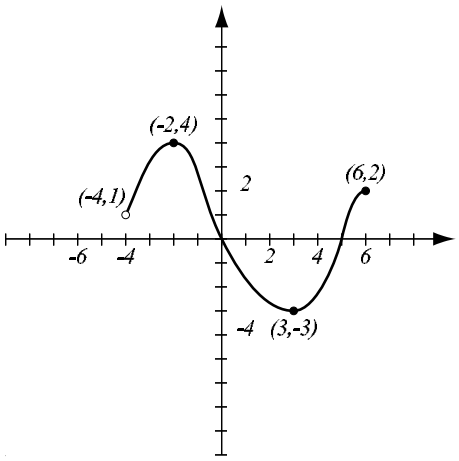
1. (5pts) Let $f(x) = x^2 + 3$ and $g(x) = x - 1$. Find the following:

$f(2) =$

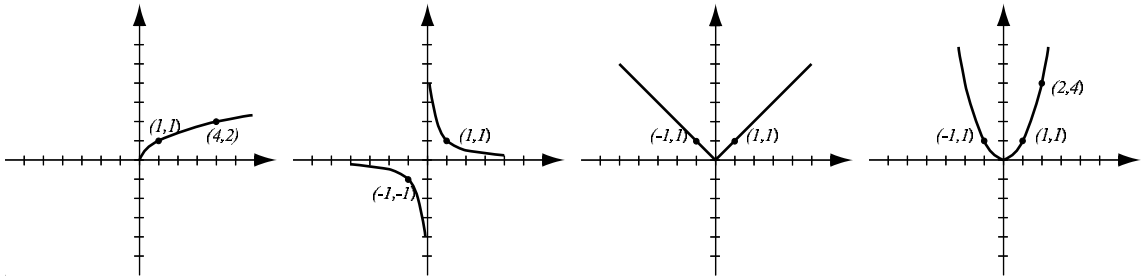
$g(3t + 4) =$

$(f \cdot g)(x) =$

2. (10pts) Use the graph of the function f, below, to answer the following questions.
a) What is $f(3)$?
b) What are the x-intercepts?
c) Where is the function increasing?
d) Where does f have a local maximum? What is its value?
e) What are the solutions of the equation $f(x) = 3$?
f) What is the domain of the function?



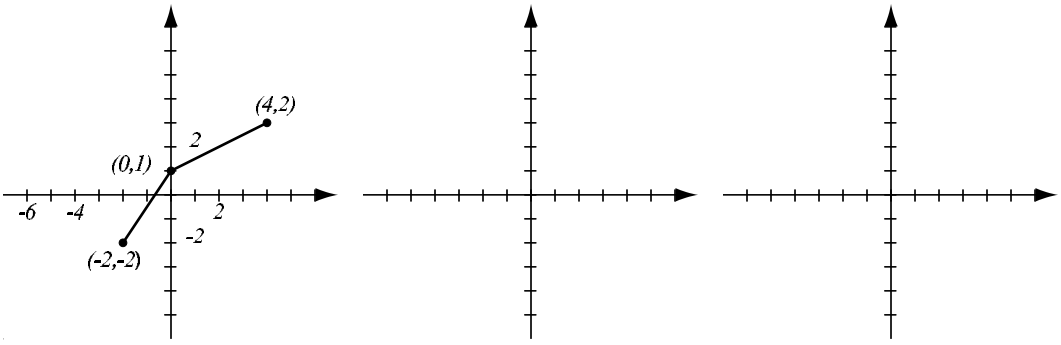
3. (4pts) The following are graphs of basic functions. Write the equation of the graph under each one.



4. (7pts) The quadratic function $f(x) = x^2 + 2x + 5$ is given. Do the following without using the calculator.
a) Find the x-intercepts of its graph, if any.
b) Find the vertex of the graph.
c) Sketch the graph of the function.
d) What is the range of the function?

5. (4pts) Find the domain of the function $f(x) = \dfrac{3}{\sqrt{5-2x}}$

6. (5pts) The graph of $f(x)$ is drawn below. Find the graphs $f(x+3)$ and $-2f(x)$ and label all the relevant points.



7. (8pts) Consider the polynomial $P(x) = x^4 - 3x^3 + x + 2$. Answer the following (decimal answers should have accuracy to two decimal places).
a) Find the x-intercepts of the graph and the y-intercept.
b) P behaves like what function for large $|x|$?
c) Find the smallest turning point of P.
d) Sketch the graph of the function on paper. Make sure scale is marked and all features you found in a)-c) are indicated.

8. (7pts) The price p and the quantity x sold of a certain product obey the demand equation $p = -\frac{1}{3}x + 100$, $0 \leq x \leq 300$.
a) Express the revenue R as a function of x.
b) What quantity maximizes revenue? What is the maximal revenue?
c) What price should the company charge to maximize revenue?

Bonus (5pts) The Crooncard company makes talking greeting cards. To wholesalers they charge \$1.25 per card for any number of cards up to 200. An order for more than 200 cards is priced as \$250 plus \$1.10 for every card in excess of 200.
a) Write the piecewise-defined function that describes the price P as a function of the number of cards x bought.
b) Sketch the graph of the function.