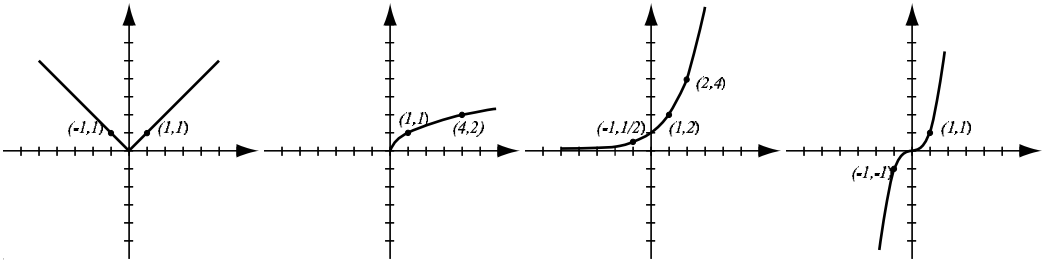
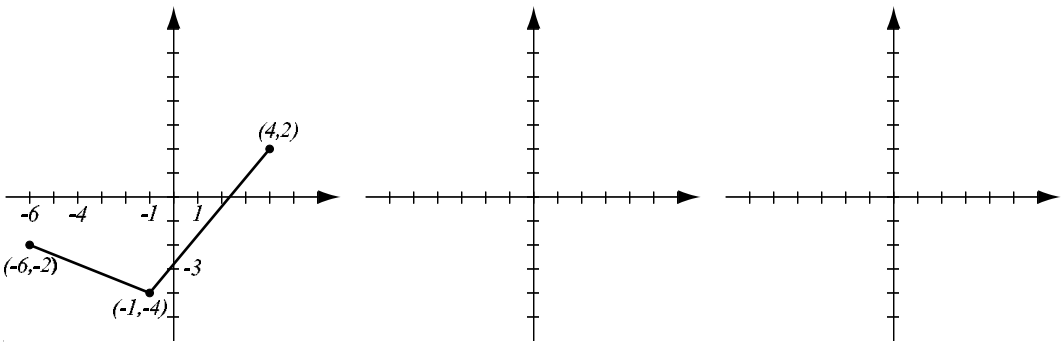
Spring '06/MAT 140/Final exam **Name:** *Show all your work.*

1. (4pts) The following are graphs of basic functions. Write the equation of the graph under each one.



2. (4pts) Find the equation of the line that passes through $(3, -2)$ and is perpendicular to the line $3x + 2y = 7$. Draw both lines in the same coordinate system.

3. (4pts) The graph of the function f is given below. On separate graphs, sketch the graphs of the functions $f(x) + 3$ and $f(2x)$. Label all the relevant points.



4. (7pts) Use the graph of the function f at right to answer the following questions.

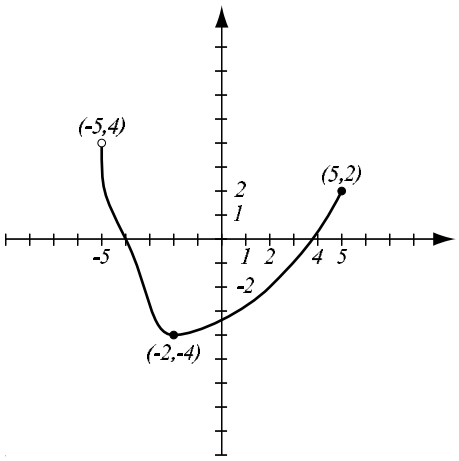
a) Find $f(2)$.

b) What is the range of f?

c) List the x-intercepts of the graph.

d) Where does f have a local minimum? What is its value?

e) What are the solutions of the equation $f(x) = 1$?



5. (7pts) The quadratic function $f(x) = x^2 - 2x - 6$ 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.

6. (7pts) Consider the polynomial $P(x) = 4(x-3)^2(x+1)$. 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 turning points 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.

7. (4pts) Simplify and write the answer so all exponents are positive:

$$\frac{(2x)^4(x^{-3}y^5)^3}{(xy)^{-4}(10y)^2} =$$

8. (4pts) Simplify.

$$\frac{x+1}{x^2+4x-5} + \frac{2x-1}{x^2+10x+25} =$$

9. (4pts) Let $f(x) = \dfrac{2x}{5x-1}$.

a) Find $f^{-1}(x)$.

b) Find the range of f.

10. (4pts) Solve the equation. $e^{x+3} = 4^{2x-1}$

11. (3pts) Write as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

$\log_5 \dfrac{(x+1)^3}{25} =$

12. (6pts) How many milliliters of a 10% solution of muriatic acid needs to be added to 150ml of a 40% solution in order to get a 30% solution? Don't forget to write down what your variable means.

13. (7pts) Sharon has 4000m of fencing and wishes to enclose a rectangular field that borders a river. If she does not fence the side along the river, what is the largest area that can be enclosed?

14. (5pts) Solve the system of equations:

$$\begin{cases} 2x & +6y & +2z & = -2 \\ -3x & +y & +2z & = -2 \\ 5x & +15y & -3z & = 3 \end{cases}$$

Bonus (7pts) The city of Semesdunn, OK, had 32,000 people six years ago and has 51,000 today. Assume the population grows according to the exponential law, $P(t) = P_0 e^{kt}$, $k > 0$.
a) Find k for this situtation.
b) Assuming growth continues according to the exponential law, what will the population be in four years?