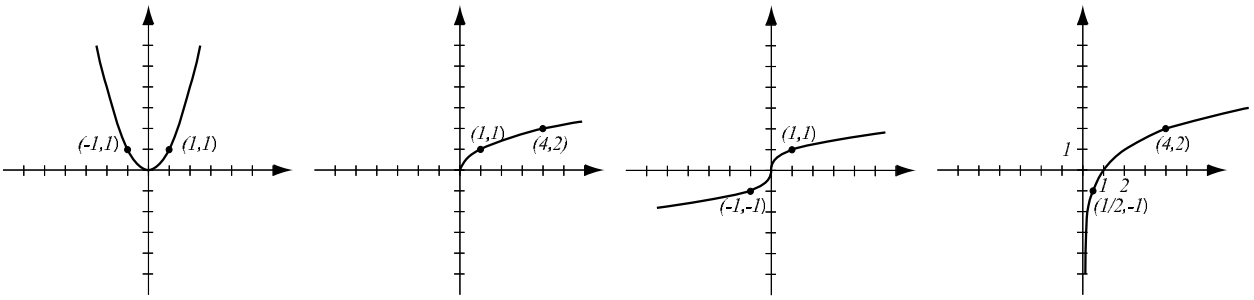
Spring '10/MAT 140/Final exam Name: *Show all your work.*

1. (8pts) The following are graphs of basic functions. Write the equation of the graph under each one.



2. (10pts) Use the graph of the function f at right to answer the following questions.

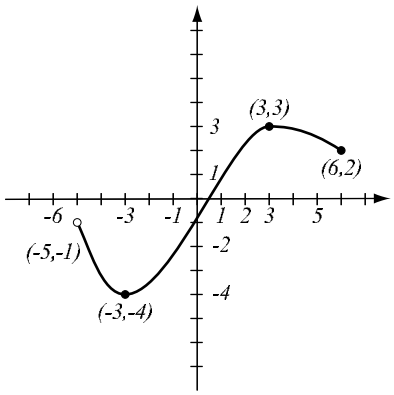
a) What is the domain of f?

b) What is the range of f?

c) Find $f(6)$ and $f(-7)$.

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

e) Find all x for which $f(x) \geq 0$.



3. (7pts) Simplify and write the answer so all exponents are positive:

$$\frac{(3x^{-2}y)^3}{(6x^4y^{-2})^2} =$$

4. (6pts) Solve the equation.

$$\frac{3x-2}{4}+3=\frac{2x-1}{12}-\frac{x+5}{3}$$

5. (7pts) Solve the inequality and write the solution using interval notation:

$|x-3|\leq 6$

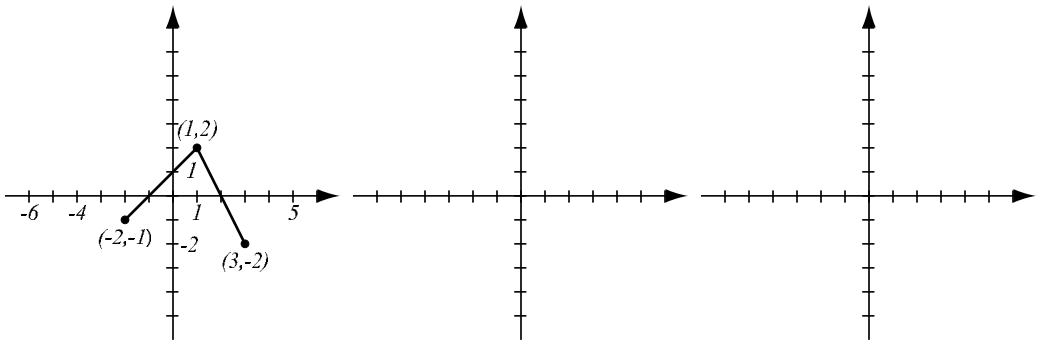
6. (10pts) Let $f(x)=x^2-3x+5$, $g(x)=2x-1$.

Find the following (simplify where possible):

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

7. (8pts) Find the equation of the line (in form $y = mx + b$) that is parallel to the line $2x - 5y = 2$ and passes through the point $(-1, 1)$.

8. (10pts) The graph of $f(x)$ is drawn below. Find the graphs of $-f(x+2)$ and $2f(x)$ and label all the relevant points.



9. (14pts) The quadratic function $f(x) = 4x^2 - 8x - 5$ is given. Do the following without using the calculator.

a) Find the x- and y-intercepts of its graph, if any.

b) Find the vertex of the graph.

c) Sketch the graph of the function.

10. (5pts) Find the domain of the function $g(x) = \dfrac{3}{\sqrt{5x-4}}$.

11. (21pts) Consider the polynomial $f(x) = x^3 + 14x^2 + 49x$.
a) Find the y- and x-intercepts algebraically. What are the multiplicities of the zeroes of f?
b) Use your calculator to draw the graph of the function (on paper!).
c) Determine algebraically whether f is even, odd, or neither. Justify your answer further by examining the graph.
d) Find all the turning points (4 decimal points accuracy).
e) Describe the end behavior of f.

12. (6pts) Write as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

$$\log_3\left(\frac{y^3}{27\sqrt{x^3}}\right) =$$

13. (6pts) Write as a single logarithm. Simplify if possible.

$$2\log_5(x-6) + 2\log_5(x+3) - \log_5(x^2-3x-18) =$$

14. (10pts) Solve the equation.

$$5^{x^2+8x+7} = 125^{x-7}$$

15. (10pts) Suppose you invest \$2,000 at a 3% interest rate, compounded monthly. How long will it take until your investment has value \$4,000?

16. (12pts) How many milliliters of a 10% solution of sulphuric acid needs to be added to 3 milliliters of a 35% solution of sulphuric acid in order to get a 25% solution? Write down the meaning of the variable you use.

Bonus (10pts) Farmer Tom has 5000 meters of fencing. He would like to enclose a rectangular area and divide it in half with a fence so that the area is the largest possible. Find the dimensions of the enclosure that will give the greatest area. What is the greatest area?