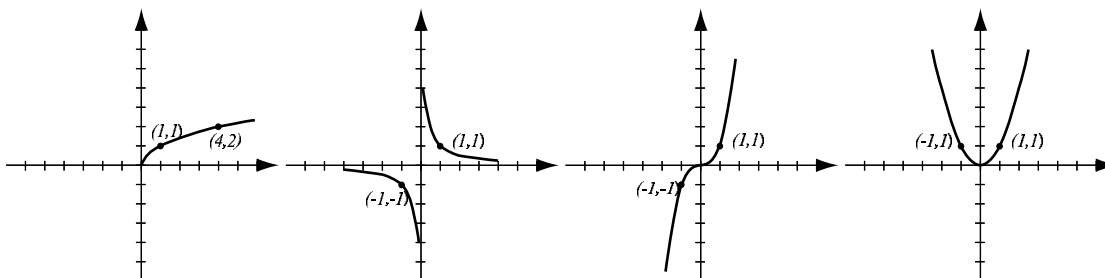
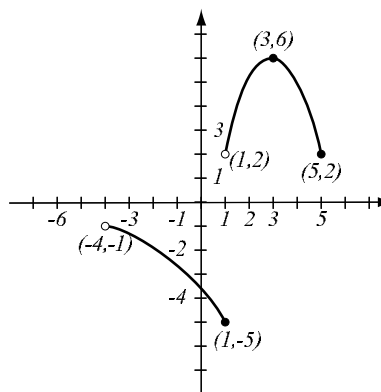


1. (8pts) The following are graphs of basic functions. Write the equation of the graph under each one.



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

- Find  $f(3)$  and  $f(1)$ .
- What is the domain of  $f$ ?
- What is the range of  $f$ ?
- What are the solutions of the equation  $f(x) = -4$ ?
- Find all  $x$  for which  $f(x) \geq 0$ .



3. (6pts) Simplify and write the answer so all exponents are positive:

$$\frac{(6x^{-3}y^{-4})^3}{(12x^{-5}y^9)^2} =$$

4. (7pts) Simplify, showing intermediate steps.

$$64^{\frac{2}{3}} =$$

$$\sqrt{75x^{11}y^6} =$$

5. (6pts) Solve the equation.

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

6. (7pts) Solve the inequality and write the solution using interval notation:

$$|x + 7| \geq 4$$

7. (8pts) Find the equation of the line (in the form  $y = mx + b$ ) that is perpendicular to the line  $3x + 2y = 7$  and passes through the point  $(2, 5)$ .

8. (4pts) Find the domain of the function  $f(x) = \frac{3x - 1}{\sqrt{2x - 5}}$  and write it in interval notation.

9. (24pts) Let  $f(x) = x^4 - 6x^2 - 7$  (answer with 4 decimal points accuracy).

a) Use your graphing calculator to accurately draw the graph of  $f$  (on paper!). Indicate scale on the graph.

b) Determine algebraically whether  $f$  is even, odd, or neither. Justify your answer further by examining the graph.

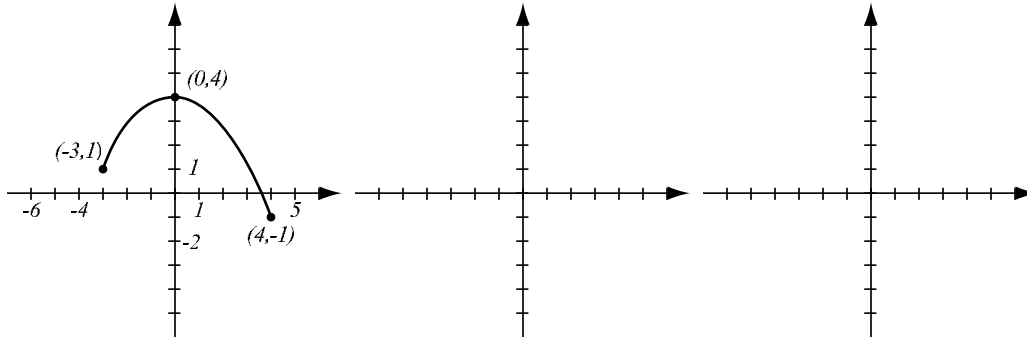
c) Algebraically find the  $x$ - and  $y$ -intercepts.

d) Find where  $f$  has a local minimum and maximum.

e) Find the intervals of increase and decrease.

f) Is the function one-to-one? Justify.

10. (10pts) The graph of  $f(x)$  is drawn below. Find the graphs of  $-f(x) + 3$  and  $f(\frac{1}{2}x)$  and label all the relevant points.



11. (14pts) The quadratic function  $f(x) = -x^2 - 4x + 12$  is given. Do the following without using the calculator.
- Find the  $x$ - and  $y$ -intercepts of its graph, if any.
  - Find the vertex of the graph.
  - Sketch the graph of the function.

12. (7pts) Write as a sum and/or difference of logarithms. Express powers as factors. Simplify if possible.

$$\log(1000\sqrt[4]{x^7y^{13}}) =$$

**13.** (7pts) Write as a single logarithm. Simplify if possible.

$$2 \log_5(x^2 - 16) - 3 \log_5(x + 4) - 2 \log_5(x - 4) =$$

**14.** (8pts) Solve the equation.

$$5^{7x+2} = 3^{4x}$$

**15.** (12pts) In 1997, the population of the island Greauf Ast was 320, in 2002, it was 414. Assume that the population grows according to the usual formula  $N(t) = N_0 e^{rt}$ .

- Find the growth rate  $r$  and the function that describes the population of Greauf Ast.
- If the island continued to grow at the same rate, what was its population in 2008?

**16.** (12pts) A runner and a walker cover the same distance. The runner finishes in half an hour, while the walker takes an hour and 15 minutes. How fast is each person going if the runner runs 4mph faster than the walker? Write down the meaning of the variable you use.

**Bonus** (10pts) Find the equation of the line that passes through the point  $(1, 2)$  and the center of the circle  $x^2 + y^2 - 6x + 8y + 1 = 0$ . Draw the line and the circle.