

Name: \_\_\_\_\_

Hour: \_\_\_\_\_

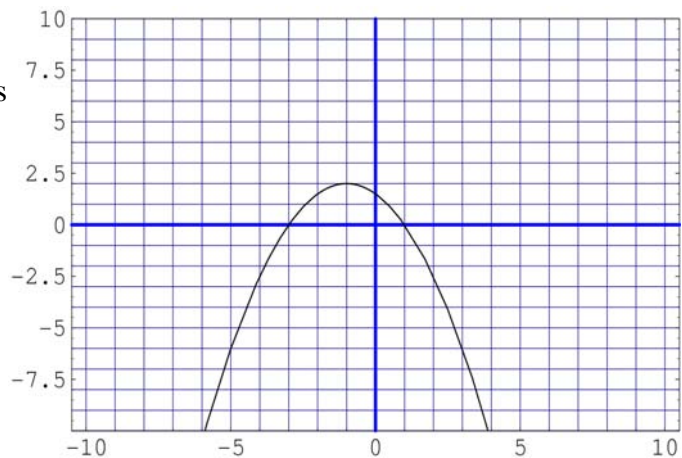
**Math 100E/F – Exam 2**  
**March 6, 2007**

1. Solve  $4x^2 - 3x - 1$

2. Write  $3x^2 - 6x + 4$  in the form  $a(x - h)^2 + k$ .

Name: \_\_\_\_\_

3. Write the equation for the parabola whose graph has its vertex at  $(-1,2)$  and which passes through the point  $(1,0)$  in the form  $y = ax^2 + bx + c$ .

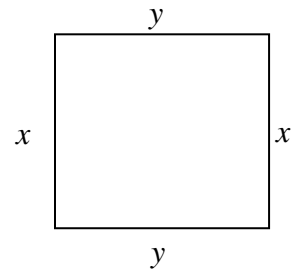


4. Let  $f(x) = x^2 + x + 1$  and  $g(x) = x^2 + 3x + 1$ . Compute  $f(x)g(x)$ . Write your answer in standard form.

Name: \_\_\_\_\_

5. You wish to make a fence to enclose a rectangular garden.

(a) Write the formulas for the perimeter (length around the rectangle) and area of the garden, in terms of  $x$  and  $y$ .



(b) Suppose you only have 100 meters of fencing. Write a formula for  $y$  in terms of  $x$ , given that the perimeter will be 100.

(c) Using your results from (b), write the formula for area as a function of just  $x$ .

(d) What is the maximum area you can enclose in a rectangular garden using just 100 meters of fencing?

Name: \_\_\_\_\_

6. The profit a company makes is given by  $P(x) = 1000 + 300x - 0.2x^2$  where  $x$  is the amount the company spends on advertising.

(a) What is the amount the company should spend on advertising to earn the maximum profit?

(b) What is the maximum profit?

Name: \_\_\_\_\_

7. Let  $f(x) = 3\sqrt{6-2x}$  on the domain  $x < 3$ . What is  $f^{-1}(x)$ ?

8. Let  $f(3) = 4$  and  $g^{-1}(5) = 4$ . What is  $g(f(3))$ ?

9. Let  $f(x) = 3x+1$  and  $g(x) = \frac{1}{3}x+2$ . Compute  $f(g(x))$ .

Name: \_\_\_\_\_

10. Solve  $|x+4|-1=2x$

11. Solve  $|3x-1|>2$ .

Name: \_\_\_\_\_

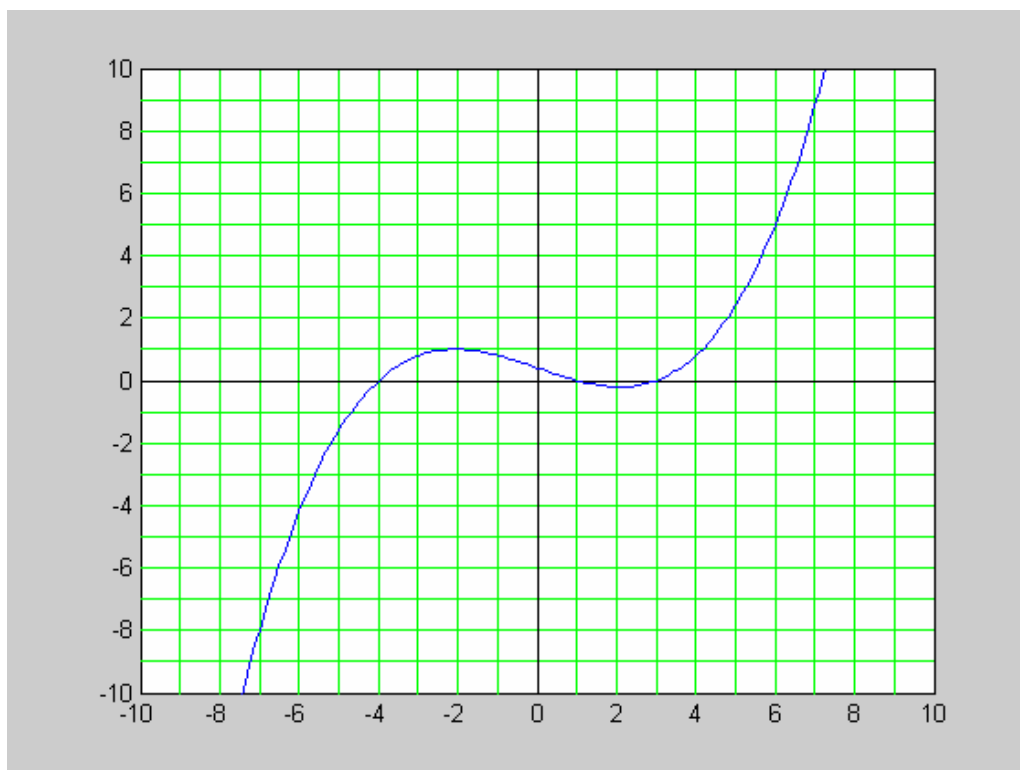
12. Solve  $\sqrt{3x+13} = x+1$

13. Solve  $x^2 + x + 3 < 2x + 5$ .

Name: \_\_\_\_\_

14. Suppose that the intelligence of a human is modeled by the function  $I(s) = 120 - s^{1.3}$  where  $s$  is the number of hours per week a person watches TV. If a person currently watches 10 hours of TV a week, how much does  $I$  increase if they stop watching TV altogether?

15. The graph of  $y = f(x)$  is shown below. Note that the curve passes through the points  $(6,5)$ ,  $(3,0)$ ,  $(1,0)$ , and  $(-4,0)$ . On the same sketch, draw the graph of  $y = f(x-2) - 3$



Name: \_\_\_\_\_

16. The 2006 federal tax rates for a single individual are given in the following table.

If taxable income is over--	But not over--	The tax is:
\$0	\$7,550	10% of the amount over \$0
\$7,550	\$30,650	\$755 plus 15% of the amount over 7,550
\$30,650	\$74,200	\$4,220.00 plus 25% of the amount over 30,650
\$74,200	\$154,800	\$15,107.50 plus 28% of the amount over 74,200
\$154,800	\$336,550	\$37,675.50 plus 33% of the amount over 154,800
\$336,550	no limit	\$97,653.00 plus 35% of the amount over 336,550

(a) Write a piecewise defined function  $f(x)$  for the amount of tax a person pays where  $x$  is taxable income and  $f$  is tax. You can limit the definition of your function to the domain  $0 < x < \$100,000$ .

(b) Taxable income is computed as income less deductions. Consider the simplest case where a person takes only the standard deduction of \$5,150, so that taxable income = total income – \$5,150. Write the formula for the tax on total income  $y$  in terms of the function  $f(x)$  you defined in part (a).

Name: \_\_\_\_\_

**Pledge:**

On my honor, as a student, I have neither given nor received unauthorized aid on this

examination: \_\_\_\_\_

(signature)

(date)