SAMPLE MIDTERM 1
MAT 123 Spring 2003
Midterm 1 is 8:30-10:00pm, Monday, 3/3/03
Exam locations given in table on right

room	sections
Javits 100	R2,R8,R9,R10,R12,R13, ELC04
Javits 101	R11
ESS 001	R5,R7, ELC03
Old Eng 143	R1,R4
Old Eng 145	R3,R6

1. Place the letter corresponding to the correct answer in the box next to each question. Each question is worth 1 point.

   (i) ☐ Suppose $a < 0$ and $b > 0$. Then which of the following must be true? **(a)** $ab > 0$ **(b)** $a - b > 0$ **(c)** $b - a > 0$ **(d)** $b^2 - a^2 > 0$ **(e)** $a^2 + b^2 < 0$ **(f)** none of these.

   (ii) ☐ The natural domain of $f(x) = \frac{\sqrt{x-5}}{x}$ is **(a)** all real numbers **(b)** $x > 0$ **c)** $x < -5$ **(d)** $-5 \le x < 0$ or $0 < x$ **(e)** $x > 5$ **(f)** none of these.

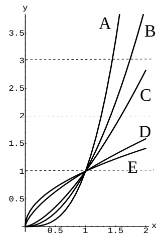
   (iii) ☐ A car drives 30 miles at 60 mph and then another 50 miles at 50 mph. What is the average speed for the entire trip? **(a)** 50 mph **(b** $52\frac{1}{2}$ mph **(c)** $53\frac{1}{3}$ mph **(d)** 55 mph **(e)** 57 mph **(f)** none of these.

   (iv) ☐ Suppose f is a linear function such that $f(1) = -1$ and $f(3) = 2$. Then $f(4) = ?$ **(a)** 3 **(b)** $3\frac{1}{3}$ **(c)** $3\frac{2}{3}$ **(d)** $3\frac{1}{2}$ **(e)** $3\frac{3}{4}$ **(f)** none of these.

   (v) ☐ Suppose S is inversely proportional to r and θ. Then **(a)** $S = k/(r\theta)$ **(b)** $S = kr^2\theta^2$ **(c)** $S = kr^2/\theta^2$ **(d)** $S = kr\theta$ **(e)** $S = kr^2\theta$ **(f)** none of these.

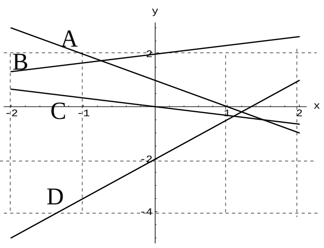
2. Each formula below corresponds to one of the graphs on the right. Put the letter of the graph in the box next to the corresponding formula.

   ☐ x^2 ☐ x^3 ☐ $x^{1/2}$ ☐ $x^{3/2}$ ☐ $x^{1/3}$



3. Each line on the right corresponds to one of the formulas on the left. Put the letter of the graph in the box next to the corresponding formula. Two boxes should be left blank.

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

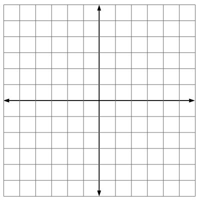
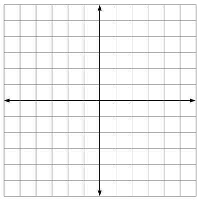
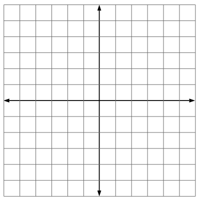


4. Sketch

   (i) $y = \frac{1}{3}x - 2$

   (ii) $y = -x^2 + 4x + 4$

   (iii) $y = \sqrt{6 - x}$

5. Answer the following questions based on the graph of the function f below. Assume the domain of the function is the interval $0 \le x \le 8$.

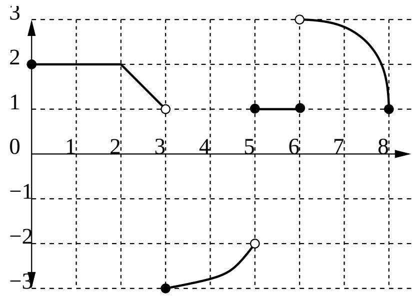
   (i) What is $f(3)$?

   (ii) Where is f decreasing?

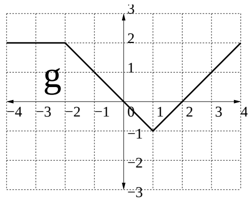
   (iii) Does f attain a maximum value?

   (iv) At what x-value is the minumum attained?

   (v) What is the range of f?



6. Find a formula the piecewise linear function g graphed below by finding the correct formula for each of its linear segments. Give the intervals on which each formula is valid.



7. A quadratic function of the form $f(x) = a(x - h)^2 + k$ has vertex at the point (2,1) and passes through the point (5,3). Find the values of a, h, k.

8. A rectangular box with a volume of 60 ft^2 has a square base. Find a function which gives its surface area S in terms of the length x of one side of the base.

9. Two ships leave port at the same time. One sails south at 15 mi/hr and the other sails east at $20mi/hr$. Find a function that gives the distace D between them in terms of the time t (in hours) since their departure.

10. Each of the following polynomials and rational functions is graphed below. Match the formulas to the correct graphs (shown on $-2 \le x \le 2$).

$\square$ $x(x-1)(x^2-4)$ $\square$ $(x-1)^2(x-2)$ $\square$ $\frac{x^2-1}{x^2} + 5$ $\square$ $\frac{x^2-1}{x}$