Math 1281 Name:
September 25, 2003

Practice Midterm Exam I

This is a closed book, closed notes exam. Calculators are allowed. Work all problems.. The first 2 problems are multiple choice. Please circle the correct answer. (There will be no partial credit for these 2 problems). Problems 3-7 are free response. For these problems please do your work in the space provided and show all work. Partial credit will be given. However a correct answer may not receive full credit if the justification is incomplete or incorrect. If you need extra space, work on the back of the pages. Please clearly label all work.

1. (10) The graph of the function $f(x)=2x^2 - 4x$ is a parabola with vertex $(x,y)=(1,-2)$, as shown in the graph at right. Where is the vertex of the parabola $y=f(x+1)+1$?

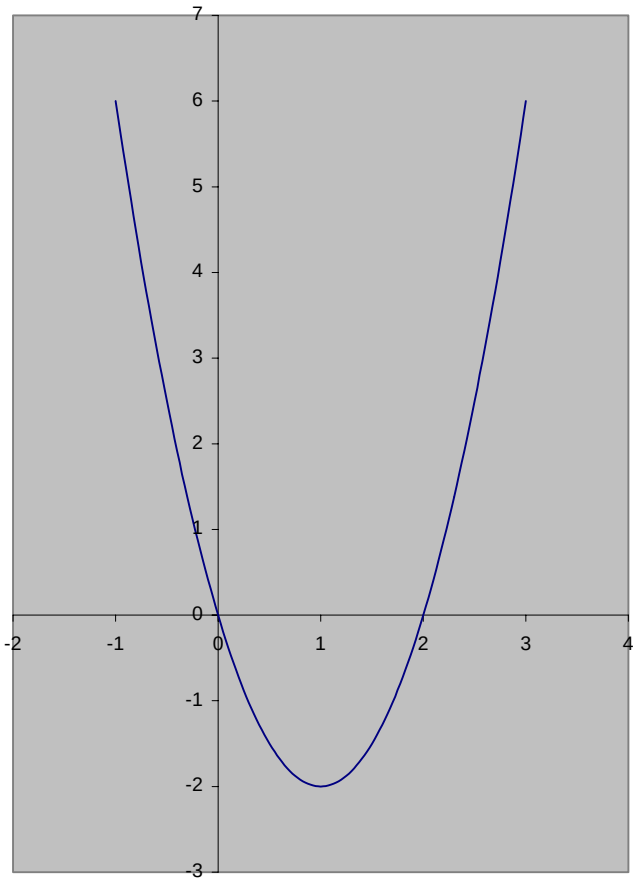
(**a) (1,2)**

(b) (2,1)

(c) (0,-1)

(d) (2,-1)

(e) None of the above



2. (10) When plotted on a log-log scale, the function $y=f(x)$ is a straight line whose slope is 1.7 and whose y-intercept is –2. More precisely, x and y are related by the equation

$$\log_{10} y = 1.7 \log_{10} x - 2.$$

Which of the following expresses the functional relation between x and y?

(a) $\mathbf{y = -2(10^{1.7x})}$

(b) $\mathbf{y = \frac{1}{100} \cdot 10^{1.7x}}$

(c) $\mathbf{y = -2\, x^{1.7}}$

(d) $\mathbf{y = \frac{1}{100} \cdot x^{1.7}}$

(e) None of the above.

3. (10) Compute the following limits.

a. (5) $\lim_{n\to\infty} \frac{2n^2+3n}{n^2-n}$

b. (5) $\lim_{n\to\infty} \frac{n\left(\sqrt{3/n+1}-1\right)}{2}$

4. (20) A population of bacteria is growing exponentially. At the beginning of the experiment, the mass of the population is 1 milligram (10^{-3} gram). Three hours later, the mass of the population is 1.5 milligrams. Assume that the same rate of exponential growth continues indefinitely.

a. (10) What will be the mass of the population 5 days after the beginning of the experiment?

b. (10) How long will it take for the mass of the population to reach 6,000,000,000,000,000,000,000 metric tons (the approximate mass of the earth)? (1 metric ton = 10^6 grams)

5. (15) Find the center and radius of the circle whose equation is $x^2 + y^2 - 6x + 4y = 0$.

6. (15) Let $f(x) = \dfrac{x-2}{x-1}$, and let $g(x) = \dfrac{x^2}{x^2+1}$.

a. (7) Find $f \circ g$.

b. (8) Find f^{-1}.

7. (20) Solve for x:

a. (7) $e^x = 2 + \frac{3}{e^x}$

b. (7) $\ln(2x-3) - \ln(2x+1) = 0$

c. (6) $|2x-3| = 6$.