

Here are some things to look at as you prepare for the exam. Remember to look at quizzes and homework problems also. The actual exam will consist of a large number of true/false and multiple choice problems, but the problems below will help you understand the concepts covered on the exam. Try to do as many of these as you can without looking in your notes or book for guidance.

The second exam will be on Thursday November 3, and will cover material in Sections 2.4, 3.3, and Chapter 5.

1. Graph the following polynomial functions:

(a) $f(x) = x^3 - x$

(b) $f(x) = x(x - 2)(x + 3)$

(c) $f(x) = x^4 - 7x^2 - 8$

2. For the following functions, do the following:

- Find the vertical asymptotes.
- Find the horizontal asymptote
- Find the x -intercepts
- Graph the function

(a) $f(x) = \frac{1}{x - 3}$

(b) $g(x) = \frac{5x - 2}{4x^2 - 4x + 3}$

(c) $h(x) = \frac{x^2 - 4}{x + 2}$

3. A cost-benefit curve for pollution control is given by

$$y = \frac{9.2x}{106 - x}$$

where y is the cost in thousands of dollars of removing x percent of a specific industrial pollutant.

- Find y if $x = 50$
- Find y if $x = 98$
- What percent of the pollutant can be removed for \$22,000?

4. If world population continues to grow as expected, the population (in billions) in year t will be given by the function

$$P(t) = 4.834(1.01)^{(t-1980)}$$

- (a) Estimate the world population in the year 2005
(b) Estimate the world population in the year 2010
(c) Estimate the world population in the year 2030
5. The scrap value of a machine is the value of the machine at the end of its useful life. By one method of calculating scrap value, where it is assumed a constant percentage of value is lost annually, the scrap value S is given by

$$S = C(1 - r)^n$$

where C is the original cost, n is the useful life of the machine in years, and r is the constant annual percentage of value lost. Find the scrap value for each of the following machines:

- (a) Original Cost \$54,000; life 8 years; annual rate of loss 12%
(b) Original Cost \$178,000; life 11 years; annual rate of loss 14%
6. The US Census Bureau predicts that the African-American population will increase from 35.3 million in 2000 to 59.2 million in 2050.
- (a) Find a model for this data in which $t = 0$ corresponds to 2000.
(b) What is the projected African-American population in 2004? in 2030?
(c) Estimate the year in which the African American population will reach 55 million.

7. Newton's Law of Cooling says that the rate at which a body cools is proportional to the difference in temperature between the body and an environment into which it is introduced. The temperature $F(t)$ of the body at time t after being introduced into an environment have constant temperature T_0 is

$$F(t) = T_0 + Cb^t$$

where C and b are constants.

Boiling water, at 100°C , is placed in a freezer at 0°C . The temperature of the water is 50°C after 24 minutes. Find the temperature of the water after 96 minutes.

8. Simplify the following expressions:

- (a) $\ln e^3$
(b) $10^{\log 7.4}$
(c) $\log_8 16$
(d) $\log_{25} 5$

9. Write each expression as a single logarithm:

- (a) $\log 4k + \log 5k^3$
(b) $4 \ln x - 2(\ln x^3 + 4 \ln x)$

10. Solve each equation:

(a) $\ln(m + 3) - \ln m = \ln 2$

(b) $2 \ln(y + 1) = \ln(y^2 - 1) + \ln 5$

(c) $\log(m + 2) = 1$

(d) $\log_2(3k - 2) = 4$

(e) $\log_5 \left(\frac{5z}{z - 2} \right) = 2$

(f) $\log_2 r + \log_2(r - 2) = 3$

(g) $2^{3x} = \frac{1}{8}$

(h) $\left(\frac{9}{16} \right)^x = \frac{3}{4}$

(i) $9^{2y-1} = 27^y$

(j) $8^p = 19$

(k) $6^{2-m} = 2^{3m+1}$

(l) $2 \cdot 15^{-k} = 18$

11. Use matrices and your calculator to solve the following systems;

(a) $-5x - 3y = 4$

$$2x + y = -3$$

(b) $3x + y - z = 13$

$$x + 2z = 9$$

$$-3x - y + 2z = 9$$

12. Gretchen Schmidt plans to buy shares of two stocks. One costs \$32 per share and pays dividends of \$1.20 per share. The other costs \$23 per share and pays dividends of \$1.40 per share. She has \$10,100 to spend and wants to earn dividends of \$540. How many shares of each stock should she buy?

13. Joyce Pluth has money in two investment funds. Last year the first fund paid a dividend of 8% and the second dividend of 2% and Joyce received a total of \$780. This year the first fund paid a 10% dividend and the second only 1% and Joyce received \$810. How much does she have invested in each fund?

14. Shirley Cicero has \$16,000 invested in Boeing and GE stock. The Boeing stock currently sells for \$30 per share and the GE stock for \$70 per share. If GE stock triples its value and the Boeing stock goes up 50%, her stock will be worth \$34,500. How many shares of each stock does she own?

15. Pretzels cost \$3 per pound, dried fruit \$4 per pound and nuts \$8 per pound. how many pounds of each should be used to produce 140 pounds of trail mix costed \$6 per pound in which there are twice as many pretzels (by weight) as dried fruit?

16. You are given \$144 in one, five, and ten dollar bills. There are two more ten dollar bills than five dollar bills. How many bills of each type are there?

17. Use matrices and your calculator to solve the following systems;

$$\begin{aligned} \text{(a)} \quad & 4x - y - 2z = 4 \\ & x - y - \frac{1}{2}z = 1 \\ & 2x - y - z = 8 \end{aligned}$$

$$\begin{aligned} \text{(b)} \quad & x - z = -3 \\ & y + z = 6 \\ & 2x - 3z = -9 \end{aligned}$$

$$\begin{aligned} \text{(c)} \quad & x - 2y + 3z = 4 \\ & 2x + y - 4z = 3 \\ & -3x + 4y - z = -2 \end{aligned}$$