

Name _____
date _____ Dec. 2006
section / time: _____

MATH 1090 FINAL EXAM

instructor: _____
2 hours with calculator

Work problems completely, either on this paper, or on another sheet, which you include with this paper.
Credit will be given for work. Circling correct answer without work to support the answer will not receive credit.
If you turn in work on another paper, number the problems so they can be found and read.
If you answer "none of the preceding," tell what the answer should be.

Work 15 of the 18 problems on this exam. Mark out the 3 problems that will not be graded. The first 15 not marked out will be scored.

1. A company charting its profits notices that the relationship between the number of units sold, x , and the profit P is linear. If 120 units sold results in \$7400 profit and 180 units results in \$12,350 profit, identify the equation that models its profit.

a) $P(x) = 17,850 - 61.67x$ b) $P(x) = 0.012x - 12,347.82$ c) $P(x) = \frac{2}{165}x + 738\frac{6}{11}$
d) $P(x) = 82.5x - 2500$ e) $P(x) = 17,300 - 82.5x$ f) none of the preceding

2. The monthly profit from producing and selling x units of a product is given by the equation $P(x) = -0.2x^2 + 24x - 180$. Producing and selling how many units will result in a profit for this product?

a) $7 < x < 127$ b) $9 < x < 111$ c) $x > 112$
d) $x = 60$ e) $x = 540$ f) none of the preceding

3. Annual sales S (in \$100,000) are related to advertising expenses x (in \$10,000) according to the function $S(x) = \frac{144x - 96}{24 + 0.8x}$. Determine the maximum annual sales if an unlimited amount is spent on advertising.

a) \$600,000 b) \$12,000,000 c) \$24,000,000
d) \$400,000 e) \$18,000,000 f) none of the preceding

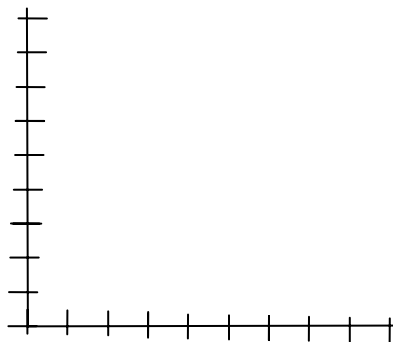
4. A certain product has supply and demand functions given by $p = 3.5q + 20$ and $p = 650 - 5.25q$, respectively. What price gives the market equilibrium?

a) \$72 b) \$272 c) \$136
d) \$124 e) \$144 f) none of the preceding

10. SLCC marketing department is charged with getting the word out about the school. To advertise to target groups, they plan to buy x number of 20-second ads on cable television, at a cost of \$175 per ad, and y number of 20-second ads on radio, at a cost of \$30 per ad. Suppose the school has at most \$6,000 to spend on advertising.

a. Write the inequality that describes this constraint on advertising.

b. Graph the region determined by this inequality in the context of the application.

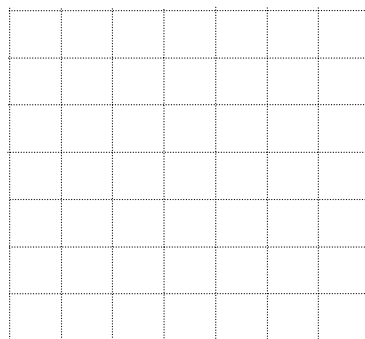


11. The future value of \$50,000 invested for 40 quarters (10 years) at rate r compounded quarterly is given by $S(r) = 50,000(1 + r)^{40}$, where r is the quarterly rate written as a decimal.

a) Complete the table to see how increasing the interest rate affects the future value of this investment.

quarterly r (rate)	S (future value, \$)
0%	
0.25%	
0.75%	
1.50%	
2.00%	
3.00%	
4.50%	

b) Graph the function for $0 \leq r \leq 0.05$.



12. The table gives the number of millions of U.S. cellular telephone subscribers. Find the quadratic function that is the best fit for the data, with x equal to the number of years from 1985 and y equal to the number of subscribers in millions.

Year	Subscribers (millions)	Year	Subscribers (millions)
1985	0.340	1994	24.134
1986	0.682	1995	33.786
1987	1.231	1996	44.043
1988	2.069	1997	55.312
1989	3.509	1998	69.209
1990	5.283	1999	86.047
1991	7.557	2000	109.478
1992	11.033	2001	128.375
1993	16.009	2002	140.767

13. The per capita tax burden T (in hundreds of dollars) can be described by $T(t) = 20.37 + 1.834t$, where t is the number of years after 1980.

(a) What is the slope of the function?

(b) Interpret the slope as a rate of change.

14. A furniture company manufactures antique and baroque chairs which are constructed using wood, hardware and fabric. The number of units of each material that is required for each product is given in the left table. Because of transportation costs to the company's two plants in Pleasantville and Richmond, the unit costs for some of the materials differ. The right table gives the unit costs of the materials at the two plants.

	Antique	Baroque
Wood	2	3
Hardware	3	1
Fabric	8	10

	Pleasantville	Richmond
Wood	\$15	\$16
Hardware	\$11	\$10
Fabric	\$ 6	\$ 7

(a) Write the matrix multiplication that shows the cost of manufacturing each type of chair at each plant.

(b) Use part (a) above to find the cost of manufacturing each type of chair at each plant.

15. At the end of an advertising campaign, the weekly retail sales of a product declined according to the equation $y = 40,000(3^{-0.1x})$ dollars, where x is the number of weeks after the campaign ended. Find the weekly sales twelve weeks after the campaign ended.

16. A couple has \$30,000 for a down payment, and they plan on monthly payments of \$2200. If the interest rate for a 25-year loan is 6% APR, how much can they spend on a house?

17. Find the inverse of $g(x) = x^2 - 3$.

18. A new dotcom company starts with three owners and five employees, but tells investors that it will grow rapidly, with the total number of people in the company given by the model $N = 2000(.004)^{0.5t}$ where t is the number of years from the present. Determine the year in which they predict that the number of employees will be 1000.

Formulas:

$$S = R \left[\frac{(1+i)^n - 1}{i} \right]$$

$$S = Pe^{rt}$$

$$S = P \left(1 + \frac{r}{k} \right)^{kt}$$

$$S = P(1+r)^t$$

$$A = R \left[\frac{1 - (1+i)^{-n}}{i} \right]$$

$$s_n = \frac{a_1(1-r^n)}{1-r} \quad (\text{if } r \neq 1)$$

$$s_n = \frac{n(a_1 + a_n)}{2}$$

$$a_n = a_1 + (n-1)d$$

$$a_n = a_1 r^{n-1}$$

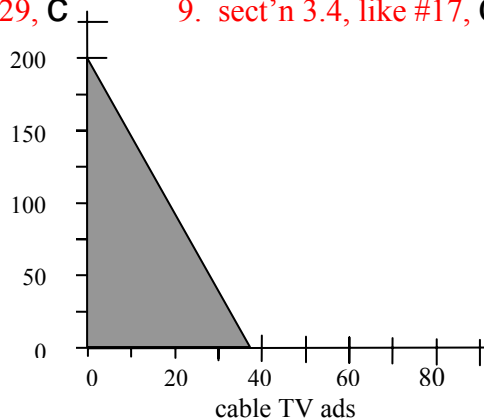
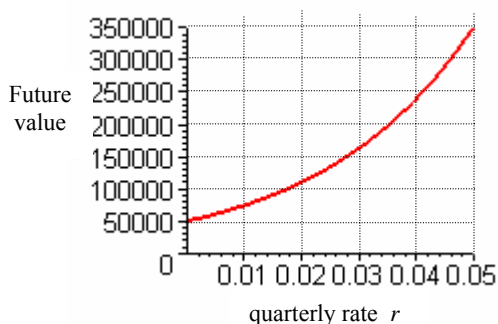
Answers — Math 1090, FINAL EXAM, Fall 2006

1. sect'n 1.4, like #47 **d** 2. sect'n 2.8, like #42, **b** 3. sect'n 4.5, like #38, **e**
 4. sect'n 1.7, like #35, **b** 5. sect'n 6.4, like #30, **d** 6. sect'n 2.1, like #49, **a**
 7. sect'n 3.3, #25, **a** 8. sect'n 5.4, like #29, **c** 9. sect'n 3.4, like #17, **d**
 10. sect'n 6.1, like #25, **a. $6000 \geq 175x + 30y$, b.**

11. sect'n 4.1, like #34, **a. \$50,000,**

**\$55,251.65, \$67,417.43, \$90,700.92,
 \$110,401.98, \$163,101.89, \$290,818.23**

b.



12. sect'n 2.5, #15, **$y = 0.731x^2 - 4,346x + 5.478$**

13. sect'n 1.3, #42, **a. 1.834, b. The tax burden has increased \$186.40 each year since 1980.**

14. sect'n 5.3, example 8, **a.** either $\begin{bmatrix} 2 & 3 & 8 \\ 3 & 1 & 10 \end{bmatrix} \cdot \begin{bmatrix} 15 & 16 \\ 11 & 10 \\ 6 & 7 \end{bmatrix} = \begin{bmatrix} P & R \\ 111 & 118 \\ 116 & 128 \end{bmatrix} \begin{matrix} A \\ B \end{matrix}$

or $\begin{bmatrix} 15 & 11 & 6 \\ 16 & 10 & 7 \end{bmatrix} \cdot \begin{bmatrix} 2 & 3 \\ 3 & 1 \\ 8 & 10 \end{bmatrix} = \begin{bmatrix} A & B \\ 111 & 116 \\ 118 & 128 \end{bmatrix} \begin{matrix} P \\ R \end{matrix}$

- b.** antique chairs cost \$111 at Pleasantville and \$118 at Richmond
 baroque chairs cost \$116 at Pleasantville and \$128 at Richmond

15. sect'n 3.1, #30, **\$10,703.22**

16. sect'n 3.6, #13, **$\$341,455 + 30,000 = \$371,445$**

17. sect'n 2.7, #18, **$g(x)^{-1} = \sqrt{x+3}$** 18. sect'n 3.7, example 4, **3 yr.**