MATH 122: TEST 1 REVIEW

Instructions: Read each question below and decide which choice (a, b, c, or d) best answers the question. Circle the letter corresponding to your choice of the best answer. Each problem is worth 6 points. If you choose the correct answer, you will receive 6 points for the problem. If you choose an incorrect answer, you will receive 0 points for the problem. If you leave a problem blank (that is, if you do not circle a letter), then you will receive 1.5 points for the problem. It is up to you to make sure that your choice for an answer or lack thereof is clear. If I have to guess at what you mean (for example, if you circle or leave marks around two letters in the same problem), then you will be given 0 points for the problem.

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Scoring:

16 questions (multiple choice, 4 choices each)

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6 points for a correct answer

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16 questions (multiple choice, 4 choices each)
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0 points for an incorrect answer

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Results of Answering All Questions Right:

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16 questions (multiple choice, 4 choices each)
6 points for a correct answer
0 points for an incorrect answer
1.5 points for no answer

Results of Answering All Questions Right:

$$16 \times 6$$

Scoring:

16 questions (multiple choice, 4 choices each)
6 points for a correct answer
0 points for an incorrect answer
1.5 points for no answer

Results of Answering All Questions Right:

$$16 \times 6 + 4$$

$\uparrow$

free

Scoring:

16 questions (multiple choice, 4 choices each)
6 points for a correct answer
0 points for an incorrect answer
1.5 points for no answer

Results of Answering All Questions Right:

$$16 \times 6 + \underset{\uparrow}{4} = 100 \text{ points}$$

free

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16 questions (multiple choice, 4 choices each)
6 points for a correct answer
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Results of Answering All Questions Right: 100 pts

$$16 \times 6 + \underset{\uparrow}{4} = 100 \text{ points}$$
free

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Results of Answering All Questions Right: 100 pts

Results of Turning in a Blank Test:

$$16 \times 1.5 + \underset{\substack{\uparrow \\ \text{free}}}{4} = 28 \text{ points}$$

Scoring:

16 questions (multiple choice, 4 choices each)
6 points for a correct answer
0 points for an incorrect answer
1.5 points for no answer

Results of Answering All Questions Right: 100 pts

Results of Turning in a Blank Test: 28 pts

Scoring:

16 questions (multiple choice, 4 choices each)
6 points for a correct answer
0 points for an incorrect answer
1.5 points for no answer

Results of Answering All Questions Right: 100 pts

Results of Turning in a Blank Test: 28 pts

Likely Results of Guessing:

Scoring:

16 questions (multiple choice, 4 choices each)
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Scoring:

16 questions (multiple choice, 4 choices each)
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0 points for an incorrect answer
1.5 points for no answer

Likely Results of Guessing:

$$4 \times 6 + 4 = 28 \text{ points}$$

$\uparrow$

free

Scoring:

16 questions (multiple choice, 4 choices each)
6 points for a correct answer
0 points for an incorrect answer
1.5 points for no answer

Likely Results of Guessing:

$$\underset{\text{likely correct}}{4} \times 6 + \underset{\text{free}}{4} = 28 \text{ points}$$

Scoring:

16 questions (multiple choice, 4 choices each)
6 points for a correct answer
0 points for an incorrect answer
1.5 points for no answer

Results of Answering All Questions Right: 100 pts

Results of Turning in a Blank Test: 28 pts

Likely Results of Guessing: 28 pts

Comments and Suggestions:

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- Guessing could lower or raise your grade.

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- The problems are not in the order you might think.

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- A calculator is not “necessary,” but you may want to use it to compare your answer with the choices.
- The problems are not in the order you might think.
- Organize yourself before Friday (terms, formulas, etc.).

Material to Study:

- lines (and slopes)
- power functions
- cost, revenue, & profit
- break-even point
- rate of change
- increasing, decreasing
- growth & decay
- growth & decay rate
- interest
- compounded annually
- logarithms
- velocity
- getting info from graphs & tables
- writing equations from given info
- marginal cost, revenue, & profit
- horizontal & vertical intercepts
- average rate of change
- concave up, concave down
- exponential growth & decay
- exponential growth & decay rate
- continuous growth & decay (rate)
- compounded continuously
- composition of functions
- solving exponential equations

Problem 1:

Let $W = f(t)$ represent wheat production in Argentina, in millions of metric tons, where t is in years since 1990. Interpret the statement $f(9) = 14$ in terms of wheat production.

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Problem 4:

Year	1991	1992	1993	1994	1995	1996	1997
Sales	19608	21970	25021	28472	30421	31645	21000

Pepsico sales in millions of dollars

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Pepsico sales in millions of dollars

a) Find the change in sales between 1991 and 1993.

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$$25021 - 19608$$

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Pepsico sales in millions of dollars

a) Find the change in sales between 1991 and 1993.

$$\mathbf{25021 - 19608 = 5413}$$

$$\mathbf{\$5,413,000,000}$$

Problem 4:

Year	1991	1992	1993	1994	1995	1996	1997
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Pepsico sales in millions of dollars

b) Find the average rate of change in sales between 1991 and 1993. Give units and interpret your answer.

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$$\frac{5413}{2}$$

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$2,706,500,000$ dollars per year

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Pepsico sales in millions of dollars

b) Find the average rate of change in sales between 1991 and 1993. Give units and interpret your answer.

$\mathbf{2,706,500,000}$ dollars per year

Pepsico made an average of $\mathbf{\$2,706,500,000}$ per year in sales between 1991 and 1993.

Problem 12:

The gross national product, G, of Iceland was 6 billion dollars in 1998. Give a formula for G (in billions of dollars) t years after 1998 if G increases by 3% per year?

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$$G = 6\,(1+r)^{t}$$

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$$G = 6\,(1+0.03)^{t}$$

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The gross national product, G, of Iceland was 6 billion dollars in 1998. Give a formula for G (in billions of dollars) t years after 1998 if G increases by 3% per year?

$$G = 6\left(1.03\right)^{t}$$

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The gross national product, G, of Iceland was 6 billion dollars in 1998. Give a formula for G (in billions of dollars) t years after 1998 if G increases by 0.2 billion dollars per year?

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$$G = m\ \ t + b$$

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A product costs $\$80$ today. How much will the product cost in t days if the price is reduced by $\$4$ per day?

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$$C = m\ t + b$$

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$$C = m\ \ t + 80$$

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$$C = m\ t + 80$$

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A product costs $\$80$ today. How much will the product cost in t days if the price is reduced by $\$4$ per day?

$$C = -4t + 80$$

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$-4t + 80$ dollars

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A product costs $\$80$ today. How much will the product cost in t days if the price is reduced by 5% per day?

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$$C = P\,(1+r)^t$$

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A product costs $\$80$ today. How much will the product cost in t days if the price is reduced by 5% per day?

$$C = 80\left(1+r\right)^{t}$$

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$$C = 80\left(1-0.05\right)^{t}$$

Problem 13:

A product costs $\$80$ today. How much will the product cost in t days if the price is reduced by 5% per day?

$$C = 80\left(1-0.05\right)^{t}$$

$$80\left(0.95\right)^{t} \text{ dollars}$$

Problem 17:

If a $950 refrigerator depreciates completely in seven years, find a formula for its value as a function of time.

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straight-line depreciation

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the value is a linear function of time

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the value is a linear function of time

$$V = m\,t + b$$

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the value is a linear function of time

$$V = m\,t + 950$$

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the value is a linear function of time

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the value is a linear function of time

$$V = m\,t + 950$$
$$\uparrow$$
$$7$$

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the value is a linear function of time

$$V = m\,t + 950$$
$$\uparrow$$
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$$V = m\,t + 950$$
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$$\begin{array}{ccc} V & = & m\,t + 950 \\ \uparrow & & \uparrow \\ 0 & & 7 \end{array}$$

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If a $\$950$ refrigerator depreciates completely in seven years, find a formula for its value as a function of time.

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the value is a linear function of time

$$0 = m\,7 + 950$$

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$$m = -\frac{950}{7}$$

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If a $\$950$ refrigerator depreciates completely in seven years, find a formula for its value as a function of time.

the value is a linear function of time

$$0 = m\,7 + 950$$

$$7m = -950$$

$$m = -\frac{950}{7} = -135.714\ldots$$

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$$V = m\,t + 950$$

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$$m = -\frac{950}{7} = -135.714\ldots$$

$$V = \quad m \quad t + 950$$

Problem 17:

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the value is a linear function of time

$$m = -\frac{950}{7} = -135.714\ldots$$

$$V = \left(-\frac{950}{7}\right) t + 950$$

Problem 27:

$$20 = 50(1.04)^x$$

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$$(1.04)^x = \frac{20}{50}$$

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$$20 = 50(1.04)^x$$

$$(1.04)^x = 2/5$$

$$x \ln(1.04) = \ln(2/5)$$

$$x = \frac{\ln(2/5)}{\ln(1.04)}$$

Problem 27:

$$20 = 50(1.04)^x$$

$$(1.04)^x = 2/5$$

$$x \ln(1.04) = \ln(2/5)$$

$$x = \frac{\ln(2/5)}{\ln(1.04)} = -23.3624\ldots$$

Problem 27:

$$20 = 50(1.04)^x$$

$$(1.04)^x = 2/5$$

$$x \ln(1.04) = \ln(2/5)$$

$$x = \frac{\ln(2/5)}{\ln(1.04)} = \frac{\ln(0.4)}{\ln(1.04)}$$

Problem 30:

If you need $\$20,000$ in your bank account in 6 years, how much must be deposited now? The interest rate is 10%, compounded continuously.

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$$P = \text{original deposit} = ?$$

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$P =$ original deposit $=$?

$A =$ amount after t years

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$$P = \text{original deposit} = ?$$

$$A = \text{amount after } t \text{ years}$$

$$= P\,e^{r\,t}$$

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$$= P\,e^{0.1\,t}$$

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$$P = \text{original deposit} = ?$$

$$A = \text{amount after } t \text{ years}$$

$$= P\,e^{0.1\,t}$$

$$20000 = P\,e^{0.1\,t}$$

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If you need $\$20,000$ in your bank account in 6 years, how much must be deposited now? The interest rate is 10%, compounded continuously.

$$P = \text{original deposit} = ?$$

$$A = \text{amount after } t \text{ years}$$

$$= P\,e^{0.1\,t}$$

$$20000 = P\,e^{0.1\,t}$$

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$$\$10,976.24$$

Problem 31:

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$$t = \frac{\ln(2)}{0.06}$$

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When does $e^{0.06\,t} = 2$?

$$0.06\,t = \ln(2)$$

$$t = \frac{\ln(2)}{0.06} = 11.55\ldots \text{ (years)}$$

Problem 37:

$$f(x) = x^2 + 1 \qquad g(x) = \ln x$$

$$f(g(x)) = ?$$

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$$g(f(x)) = \ln f(x) = \ln(x^2 + 1)$$
$$g(f(x)) = g(x^2 + 1) = \ln(x^2 + 1)$$

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$$f(f(x)) = f(x)^2 + 1 = (x^2 + 1)^2 + 1$$
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$$f(g(x)) = (\ln x)^2 + 1$$
$$g(f(x)) = \ln(x^2 + 1)$$
$$f(f(x)) = (x^2 + 1)^2 + 1$$

Problem 43(a):

A company produces and sells shirts. The fixed costs are $\$7000$ and the variable costs are $\$5$ per shirt. Shirts are sold at $\$12$ each. Find cost and revenue as functions of the quantity of shirts, q.

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$$C = 7000 + 5q \qquad R = 12q$$

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$$C = 7000 + 5q \qquad R = 12q$$