MATH 100 College Algebra Test 1

Calculators: You may use standard calculators or graphing calculators on this exam BUT problems marked with an * you should be able to do without using a calculator. On future tests there will be a page which you must complete without the use of a calculator.

Show all work.

1. Express the following in decimal form, your answer should be exact:
   \[
   \left( \frac{1}{7} + \frac{1}{14} \right) \left( \frac{1}{3} - \frac{3}{14} \right) = \frac{2+1}{7-3} = \frac{3}{4} = .75
   \]

2. What would the price of corn per bushel have to be for a farmer to get a revenue of $70,000 on the sale of 28,000 bushels?
   \[28,000 \times x = 70,000 \quad \Rightarrow \quad x = \frac{70}{28} = \$2.50 \]

3. Solve for T:
   \[
   \frac{T+1}{T-2} = 4
   
   T+1 = 4(T-2)
   
   T+1 = 4T-8
   
   9 = 3T
   \]

4. Bill paid $230,000 for his house. Since then housing prices have declined by 14%. Assuming the price he paid represented the value of his house at the time, what is his house worth now?
   \[
   (100-14) = 86\% \quad (230,000)(.86) = \$197,800
   \]

5. Find an equation for the line that passes through the points (1,7) and (-1,1).
   \[
   m = \frac{7-1}{1-(-1)} = \frac{6}{2} = 3
   
   y = 3x + b
   
   7 = 3 + b \quad (b = 4)
   
   y = 3x + 4
   \]

6. A company has an incremental production cost of $10 per unit it produces, and the company's fixed costs are $2400 per month.
   a. What price would the company need to charge in order to break even at a production quantity of 300?
   \[
   \text{Cost} = 2400 + 10(360) = 2400 + 3600 = 5400
   
   \text{Revenue} = 300x
   
   300x = 5400
   
   x = \frac{5400}{300} = 18
   \]
   b. What percentage mark-up is that price relative to the incremental production cost of $10 per unit?
   \[
   \frac{8}{10} \times 100 = 80\% \text{ mark-up}
   \]
7. To earn two bachelor's degrees simultaneously at Salisbury University a student must complete the requirements for two majors and must earn 150 credits. Suppose you wish to earn two degrees by taking a combination of 3-credit and 4-credit courses. If you do not want to take any "extra" credits:

a. Write an equation relating the number of 3-credit courses you take to the number of 4-credit courses.

\[3T + 4F = 150\]

b. How many 3 credit courses must you take if you take twenty-seven 4-credit courses?

\[
\begin{align*}
3T + 4(27) &= 150 \\
3T + 108 &= 150 \\
3T &= 42 \\
T &= 14
\end{align*}
\]

c. Using the box to the right, graph the relationship you found in part a.

d. If you have already taken ten 3-credit courses and eight 4-credit courses, indicate on your graph the region that is still feasible for you.

8. Graph the following conditional equation then derive an expression for the inverted form of the equation:

\[
T = \begin{cases} 
10 - Z & \text{for } 0 \leq Z \leq 5 \\
15 - \frac{Z}{2} & \text{for } 5 < Z < 9 \\
12 - Z & \text{for } 9 \leq Z 
\end{cases}
\]

\[
Z = \begin{cases} 
10 - T & \text{for } T < 3 \\
15 - 2T & 3 \leq T \leq 5 \\
10 - T & 5 < T 
\end{cases}
\]

9. Solve the following system of equations:

\[
\begin{align*}
3x + 5(2x + y) &= 34 \\
3x + 10x - 5 &= 34 \\
x &= 3 \\
3x + 5y &= 34 \\
6x - 3y &= 3 \\
6y - 3 &= 3y \\
2x + 1 &= y \\
2(3) - 1 &= 6 - 1 = 5
\end{align*}
\]

x = 3
y = 5

10. The temperature in degrees Fahrenheit, \( F \) is related to the temperature in degrees Celsius, \( C \) by the equation \( F = 32 + 1.8C \). At what temperature are the measurements in degrees Fahrenheit and in degrees Celsius the same?

\[
\begin{align*}
F &= 32 + 1.8F \\
-0.8F &= -32 \\
F &= \frac{-32}{-0.8} = -40 \\
F &= C = -40 \degree F
\end{align*}
\]