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:

\[
\left( \frac{1}{7} - \frac{1}{14} \right) = \frac{2}{7} = \frac{1}{5} = 0.2
\]

*2. What would the price of corn per bushel have to be for a farmer to get a revenue of $135,000 on the sale of 30,000 bushels?

\[
30,000x = 135,000
\]
\[
x = \frac{135,000}{30} = 4,500
\]

*3. Solve for T:

\[
\frac{T+1}{T-1} = 3
\]
\[
2 = T
\]

4. Bill paid $220,000 for his house. Since then housing prices have declined by 16%. Assuming the price he paid represented the value of his house at the time, what is his house worth now?

\[
\frac{100}{1.84} (\$220,000) = \$184,800
\]

*5. Find an equation for the line that passes through the points (1,7) and (-1,-1).

Graph the line.

\[
m = \frac{7 - (-1)}{1 - (-1)} = \frac{8}{2} = 4
\]

\[
y = 4x + b
\]
\[
\frac{7}{2} = 4 \cdot 1 + b
\]
\[
b = \frac{3}{2}
\]

6. A company has an incremental production cost of $20 per unit it produces, and the company’s fixed costs are $2100 per month.

a. What price would the company need to charge in order to break even at a production quantity of 300?

Cost = 2100 + 20Q = 2100 + 20(300) = 2100 + 6000 = 8100

Revenue = 300x = 8100 \implies x = \frac{8100}{300} = \frac{81}{3} = \$27

b. What percentage mark-up is that price relative to the incremental production cost of $20 per unit?

\[
\text{mark up} = \frac{\$7}{20} \times 100 = 35\%
\]
7. To earn two bachelors 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-one 4-credit courses?

\[ 3T + 4(21) = 150 \]
\[ 3T + 84 = 150 \]
\[ 3T = 66 \]
\[ T = 22 \]

22 courses

c. Using the box to the right, graph the relationship you found in part a. 
\[ (0, 37.5), (50, 0) \text{ other way } (0, 50), (37.5, 0) \]

d. If you have already taken two 3-credit courses and twenty-five 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:

\[ T = \begin{cases} 
10 - Z & \text{for } 0 \leq Z \leq 5 \\
6 - \frac{1}{5}Z & \text{for } 5 < Z < 10 \\
14 - Z & \text{for } Z \leq 10 
\end{cases} \]

9. Solve the following system of equations:

\[ 3x + 5y = 21 \]
\[ 2x + 5(2x - 1) = 21 \]
\[ 3x + 10x - 5 = 21 \]
\[ 13x = 26 \Rightarrow x = 2 \]
\[ y = 2(2) - 1 = 3 \]

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?

\[ F = 32 + 1.8C \Rightarrow -0.8F = -32 \]
\[ F = \frac{-32}{0.8} = \frac{-320}{8} = -40 \]

\[ F = -40^\circ C \]