MTH 103 College Algebra, Quiz 2

Directions: Please answer in the space provided. Answers without supporting work may not receive full credit. You have 10 minutes to complete this quiz.

Calculator Policy: You may use a simple or graphing calculator (the TI-83 or TI-84 is recommended) which does NOT have a computer algebra system (CAS). You may NOT use calculators such as the TI-89/92+/NSPIRE, Voyage 200, HP49G/49G+/50G, Casio algefx2.0/algefx2.9pks, nor may you use a cell phone, tablet, ipad, or other internet capable device.

1. (2 points each) Determine the solutions to the equations shown below.

(a) \( x^2 - 7x - 30 = 0 \)  
\[
(x - 10)(x + 3) = 0
\]
\[
x = -3, 10
\]

(b) \( x^2 + 3x = -1 \)  
\[
x^2 + 3x + 1 = 0
\]
Can't factor using integers...

Optim(1)
\[
x^2 + 3x + \frac{9}{4} = -1 + \frac{9}{4}
\]
\[
\left(x + \frac{3}{2}\right)^2 = \frac{5}{4}
\]
\[
x = -\frac{3}{2} \pm \sqrt{\frac{5}{4}}
\]
Optim(2)
\[
x = -\frac{3}{2} \pm \frac{\sqrt{5}}{2}
\]

1. Same
2. (6 points) How many milliliters (mL) of a 25% sugar solution should be added to 200 mL of a 10% sugar solution to increase the concentration to 12%. Please write your answer either as a fraction or as a decimal rounded to the nearest tenth.

Known: two types, 25% and 10%.
200 mL of 10% final concentration 12%.

Unknown: How much 25% to add?

Call \( T \) (T for Twenty-Five)

Goal: Find \( T \).

Starting volume: \( T \) of 25% solution
200 mL of 10% solution
Final volume: \((T + 200)\) of 12% solution

\[
\frac{25}{100}T + \frac{10}{100}(200) = \frac{12}{100}(T + 200)
\]

\[\frac{25T + 2000}{100} = \frac{12T + 2400}{100}\]

\[25T + 2000 = 12T + 2400\]

\[13T = 400\]

\[T \approx 30.769\ldots\]

Round to nearest tenth: \(30.8\text{ mL}\)
Solutions (Page 1 of 2)

(5:20 Recitation)

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1. (2 points each) Determine the solutions to the equations shown below.

   (a) $x^2 - 8x - 20 = 0$

   \[
   \begin{aligned}
   (x - 10)(x + 2) &= 0 \\
   x &= -2, 10
   \end{aligned}
   \]

   (b) $x^2 + 5x = -1$.

   \[
   \begin{aligned}
   x^2 + 5x + 1 &= 0 \\
   (x + \tfrac{5}{2})^2 &= \tfrac{21}{4} \\
   x &= -\tfrac{5}{2} \pm \sqrt{\tfrac{21}{4}}
   \end{aligned}
   \]
2. (6 points) How many milliliters (mL) of a 25% sugar solution should be added to 200 mL of a 15% sugar solution to increase the concentration to 22%. Please write your answer either as a fraction or as a decimal rounded to the nearest tenth.

Known: two types: 25% and 15%.

200 mL of 15%final concentration 22%.

Unknown: How much 25% to add?

Call it \( T \) (\( T \) for Twenty-Five)

Goal: Find \( T \).

Starting volume: \( T \) of 25% solution

200 mL of 15% solution

Final volume: \( 200 + T \) mL of 22% solution

\[
\frac{25}{100} T + \frac{15}{100} (200) = \frac{22}{100} (200 + T)
\]

\[
25T + 3000 = 4400 + 22T
\]

\[
3T = 1400
\]

\[
T \approx 466.66...
\]

Rounded to nearest tenth: \[
\underline{466.7 \text{ mL}}
\]