Math 162

Melrose

Test 2-Bonus Solutions

1. Find all real solutions to the following.

(a) \( x^2 - \sqrt{8}x + 1 = 0 \rightarrow x = \frac{\sqrt{8} \pm \sqrt{8 - 4}}{2} = \sqrt{2} \pm 1 \)

(b) \( \frac{x + 1}{x - 1} = \frac{3x}{3x - 6} \rightarrow (x + 1)(3x - 6) = (3x)(x - 1) \rightarrow 3x^2 - 3x - 6 = 3x^2 - 3x \rightarrow -6 = 0 \)
No Solutions.

(c) \( 2x^2 + 7x + 5 = 0 \rightarrow (2x + 5)(x + 1) = 0 \rightarrow x = \frac{-5}{2}, -1 \)

\[
\begin{array}{c|cccc}
& x & -1 & < 0 & < 1 \\
\hline
x + 1 & - & 0 & + & + & +
\end{array}
\]

\[
\begin{array}{c|cccc}
x \quad 1 - x & + & + & + & + & 0 \\
\hline
x(1 - x) & + & ? & 0 & + & 0
\end{array}
\]

\[x \in (-\infty, -1) \cup [0,1]\]

(e) \( \sqrt{8 - \sqrt{x+5}} = 2 \rightarrow 8 - \sqrt{x+5} = 4 \rightarrow 16 = x + 5 \rightarrow x = 11 \)

(f) \( x^5 = 8x^2 \rightarrow x^3(x^2 - 8) = x^2(x - 2)(x^2 + 2x + 4) = 0 \rightarrow x = 0, 2 \)

2. Senga cycles 8mph faster than she runs. Every morning before her Math 162 class she runs \(\frac{21}{2}\) miles and cycles 4miles for a total of one hour of exercise. How fast does she run?

Let \( x \) be Senga’s speed running in mph. This means \( x + 8 \) is her speed cycling. Know that total workout time is one hour. Figure out how much time she needs to run and cycle using \( t = \frac{d}{r} \).

\[
\frac{5}{2x} + \frac{4}{x + 8} = 1 \rightarrow 5(x + 8) + 4(2x) = 2x(x + 8) \rightarrow 2x^2 + 3x - 40 = 0 \rightarrow x = \frac{-3 \pm \sqrt{329}}{4}.
\]

Since \( x \) must be positive, \( x = \frac{-3 + \sqrt{329}}{4} \approx 3.78 \) mph.

3. The approximate stopping distance \( d \), in feet, of a car is given by \( d = x + \frac{x^2}{20} \) where \( x \) is the speed of the car, in mph, when the brakes were applied. If a car travels 75 feet before stopping, what was its speed when the brakes were applied?

\[ 75 = x + \frac{x^2}{20} \rightarrow x^2 + 20x - 1500 = (x + 50)(x - 30) = 0. \] Therefore, \( x = 30 \) mph.