

East Los Angeles College
Department of Mathematics
Math 245
Test 1

Solutions

Solve the following equations for x

1. $-3x + 8 = -13$

2. $3(x - 4) = 15$

3. $\frac{x}{6} + 2 = -3$

4. $-3x + 2 = 2(x - 3)$

5. $3x + \frac{1}{2} = \frac{1}{4}$

6. $\frac{x}{5} = \frac{5}{4}$

7. $x^2 + 3x - 40 = 0$

8. $3x^2 + 5x = 2$

9. $2x^2 = -17x - 30$

10. $x^2 - 6x = 16$

11. $x^2 - 16 = 0$

12. $x^2 - 20 = 0$

13. $4x^2 - 3 = -7$

14. $3x^2 + 8 = 17$

15. $(x + 2)^2 = 25$

16. $(x - 3)^2 = -32$

17. $x^2 - 2x + 9 = 0$

18. $x^2 + x + 5 = 0$

19. $2x^2 - x + 6 = 0$

20. $3x^2 + 2x + 1 = 0$

21. What is your name?

Answer Sheet

1	7	-	12	$2\sqrt{5}, -2\sqrt{5}$	=
2	9	-	13	$i, -i$	=
3	-30	-	14	$\sqrt{3}, -\sqrt{3}$	=
4	$\frac{8}{5}$	-	15	3, -7	=
5	$-\frac{1}{12}$	-	16	$8 + 4\sqrt{2}i$ $8 - 4\sqrt{2}i$	- -
6	$\frac{25}{4}$	-	17	$1 + 2\sqrt{2}i$ $1 - 2\sqrt{2}i$	- -
7	-8, 5	=	18	$-\frac{1}{2} + \frac{\sqrt{19}}{2}i$ $-\frac{1}{2} - \frac{\sqrt{19}}{2}i$	- -
8	$\frac{1}{3}, 2$	=	19	$\frac{1}{4} + \frac{\sqrt{47}}{4}i$ $\frac{1}{4} - \frac{\sqrt{47}}{4}i$	- -
9	$-\frac{5}{2}, -6$	=	20	$-\frac{1}{3} + \frac{\sqrt{2}}{3}i$ $-\frac{1}{3} - \frac{\sqrt{2}}{3}i$	- -
10	8, -2	=	21	Solutions	
11	4, -4	=			

math 245 Test 1 Solutions

$$\textcircled{1} \quad \begin{array}{rcl} -3x + 8 & = & -13 \\ -8 & -8 & \end{array}$$

$$\begin{array}{rcl} -3x & = & -21 \\ \underline{-3} & & \underline{-3} \end{array}$$

$$\boxed{x = 7}$$

$$\textcircled{2} \quad 3(x-4) = 15$$

$$\begin{array}{rcl} 3x - 12 & = & 15 \\ +12 & +12 & \end{array}$$

$$\begin{array}{rcl} 3x & = & 27 \\ \underline{3} & & \underline{3} \end{array} ; \boxed{x = 9}$$

$$\textcircled{3} \quad \begin{array}{rcl} \frac{x}{6} + 2 & = & -3 \\ -2 & -2 & \end{array}$$

$$6 \cdot \frac{x}{6} = -5 \cdot 6$$

$$\boxed{x = -30}$$

$$\textcircled{4} \quad -3x + 2 = 2(x-3)$$

$$\begin{array}{rcl} -3x + 2 & = & 2x - 6 \\ -2x & -2x & \end{array}$$

$$\begin{array}{rcl} -5x + 2 & = & -6 \\ -2 & -2 & \end{array}$$

$$\begin{array}{rcl} -5x & = & -8 \\ \underline{-5} & & \underline{-5} \end{array} ; \boxed{x = \frac{8}{5}}$$

$$\textcircled{5} \quad \begin{array}{rcl} 3x + \frac{1}{2} & = & \frac{1}{4} \\ -\frac{1}{2} & -\frac{1}{2} & \end{array}$$

$$3x = \frac{1}{4} - \frac{1}{2}$$

note $\frac{1}{4} - \frac{1 \cdot 2}{2 \cdot 2}$

$$\frac{1}{4} - \frac{2}{4}$$

$$-\frac{1}{4}$$

$$\begin{array}{rcl} 3x & = & -\frac{1}{4} \\ \underline{3} & & \underline{3} \end{array}$$

$$x = -\frac{1}{4} \div 3$$

$$x = -\frac{1}{4} \cdot \frac{1}{3}$$

$$\boxed{x = -\frac{1}{12}}$$

$$(6) \quad \cancel{\frac{x}{8} = \frac{5}{4}} ; \quad \frac{4x}{4} = \frac{25}{4} ; \quad x = \frac{25}{4}$$

$$(7) \quad x^2 + 3x - 40 = 0$$

$$(x + 8)(x - 5) = 0$$

$$\begin{array}{r} x + 8 = 0 \\ -8 -8 \end{array}$$

$$x = -8$$

$$\begin{array}{r} x - 5 = 0 \\ +5 +5 \end{array}$$

$$x = 5$$

$$(8) \quad 3x^2 + 5x = 2$$

$$3x^2 + 5x - 2 = 0$$

$$\left(x - \frac{1}{3}\right)\left(x - \frac{6}{3}\right) = 0$$

$$\begin{array}{r} -6 \\ -1 \quad 6 \\ 3 \end{array}$$

$$(3x - 1)(x - 2) = 0$$

$$\begin{array}{r} 3x - 1 = 0 \\ +1 +1 \end{array}$$

$$3x = 1$$

$$x = \frac{1}{3}$$

$$\begin{array}{r} x - 2 = 0 \\ +2 +2 \end{array}$$

$$x = 2$$

$$(9) \quad 2x^2 = -17x - 30$$

$$2x^2 + 17x = -30$$

$$2x^2 + 17x + 30 = 0$$

$$\left(x + \frac{5}{2}\right)\left(x + \frac{12}{2}\right) = 0$$

$$\begin{array}{r} 1 \cdot 60 \\ 2 \cdot 30 \\ 4 \cdot 15 \\ 5 \cdot 12 \end{array}$$

(See next page)

$$(2x + 5)(x + 6) = 0$$

$$(2x+5)(x+6) = 0$$

$$\begin{array}{l} 2x+5=0 \\ -5 \quad -5 \end{array}$$

$$\frac{2x}{2} = \frac{-5}{2}$$

$$x = -5/2$$

$$\begin{array}{l} x+6=0 \\ -6 \quad -6 \end{array}$$

$$x = -6$$

$$\begin{array}{l} (10) \quad x^2 - 6x = 16 \\ -16 \quad -16 \end{array}$$

$$x^2 - 6x - 16 = 0$$

$$(x-8)(x+2) = 0$$

$$\begin{array}{l} x-8=0 \\ +8 \quad +8 \end{array}$$

$$x = 8$$

$$\begin{array}{l} x+2=0 \\ -2 \quad -2 \end{array}$$

$$x = -2$$

$$\begin{array}{l} (11) \quad x^2 - 16 = 0 \\ +16 \quad +16 \end{array}$$

$$x^2 = 16$$

$$x = \pm \sqrt{16} = \pm 4$$

$$x = \pm 4$$

$$x = 4, x = -4$$

$$\begin{array}{l} (12) \quad x^2 - 20 = 0 \\ +20 \quad +20 \end{array}$$

$$x^2 = 20, x = \pm \sqrt{20}$$

$$\text{note } \sqrt{20} = \sqrt{4 \cdot 5}$$

$$= \sqrt{4} \sqrt{5}$$

$$= 2\sqrt{5}$$

$$x = \pm 2\sqrt{5}$$

$$x = 2\sqrt{5}, x = -2\sqrt{5}$$

$$\begin{array}{l} (13) \quad 4x^2 - 3 = -7 \\ +3 \quad +3 \end{array}$$

$$\frac{4x^2}{4} = \frac{-4}{4}$$

$$x^2 = -1, x = \pm \sqrt{-1}$$

$$x = \pm i$$

$$x = i, x = -i$$

$$(14) \quad \begin{array}{ccc} 3x^2 + 0 & = & 12 \\ -0 & -0 & \end{array}$$

$$\frac{3x^2}{3} = \frac{12}{3}$$

$$x^2 = 4$$

$$x = \pm \sqrt{4}$$

$$x = \sqrt{4} \text{ or } x = -\sqrt{4}$$

$$(15) \quad (x+2)^2 = 25$$

$$x+2 = \pm \sqrt{25}$$

$$\begin{array}{ccc} x+2 & = & \pm 5 \\ -2 & -2 & \end{array}$$

$$x = -2 \pm 5$$

$$x = -2+5 ; x = -2-5$$

$$x = 3$$

$$x = -7$$

$$(16) \quad (x-8)^2 = -32$$

$$\begin{array}{ccc} x-8 & = & \pm 4\sqrt{2}i \\ +8 & +8 & \end{array}$$

$$x-8 = \pm \sqrt{-32}$$

$$x = 8 \pm 4\sqrt{2}i$$

$$\text{rule } \sqrt{-32} = \sqrt{-1 \cdot 32}$$

$$= \sqrt{-1} \sqrt{32}$$

$$= i \sqrt{(16) \cdot 2}$$

$$= i \sqrt{16} \sqrt{2}$$

$$= i \cdot 4 \sqrt{2}$$

$$x = 8 + 4\sqrt{2}i$$

$$x = 8 - 4\sqrt{2}i$$

$$(A) \quad x^2 - 2x + 9 = 0$$

not factorable!

$$a=1, b=-2, c=9$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4 \cdot 1 \cdot 9}}{2 \cdot 1}$$

$$x = \frac{2 \pm \sqrt{4 - 36}}{2}$$

$$x = \frac{2 \pm \sqrt{-32}}{2}$$

note See prior note

$$\sqrt{-32} = 4\sqrt{2}i$$

$$x = \frac{2 \pm 4\sqrt{2}i}{2}$$

$$x = \frac{2}{2} \pm \frac{4\sqrt{2}i}{2}$$

$$x = 1 \pm 2\sqrt{2}i$$

$$x = 1 + 2\sqrt{2}i$$

$$x = 1 - 2\sqrt{2}i$$

$$(19) \quad x^2 + x + 5 = 0$$

$$a=1, b=1, c=5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 1 \cdot 5}}{2 \cdot 1}$$

$$x = \frac{-1 \pm \sqrt{1 - 20}}{2}$$

$$x = \frac{-1 \pm \sqrt{-19}}{2}$$

$$x = \frac{-1 \pm \sqrt{19}i}{2}$$

$$x = -\frac{1}{2} \pm \frac{\sqrt{19}}{2}i$$

$$x = -\frac{1}{2} + \frac{\sqrt{19}}{2}i$$

$$x = -\frac{1}{2} - \frac{\sqrt{19}}{2}i$$

$$(19) \quad 2x^2 - x + 6 = 0$$

$$a = 2, b = -1, c = 6$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4 \cdot 2 \cdot 6}}{2 \cdot 2}$$

$$x = \frac{1 \pm \sqrt{1 - 48}}{4}$$

$$x = \frac{1 \pm \sqrt{-47}}{4}$$

note $\sqrt{-47} = \sqrt{-1 \cdot 47}$

$$= \sqrt{-1} \sqrt{47}$$

$$= i \sqrt{47}$$

$$\sqrt{47} i$$

$$x = \frac{1 \pm \sqrt{47} i}{4}$$

$$x = \frac{1}{4} \pm \frac{\sqrt{47} i}{4}$$

$$x = \frac{1}{4} + \frac{\sqrt{47} i}{4}$$

$$x = \frac{1}{4} - \frac{\sqrt{47} i}{4}$$

$$(20) \quad 3x^2 + 2x + 1 = 0$$

$$a = 3, \quad b = 2, \quad c = 1$$

$$x = \frac{-2 \pm 2\sqrt{2}i}{6}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-2}{6} \pm \frac{2\sqrt{2}i}{6}$$

$$x = -\frac{1}{3} \pm \frac{\sqrt{2}}{3}i$$

$$x = \frac{-2 \pm \sqrt{2^2 - 4 \cdot 3 \cdot 1}}{2 \cdot 3}$$

$$x = -\frac{1}{3} + \frac{\sqrt{2}}{3}i$$

$$x = \frac{-2 \pm \sqrt{4 - 12}}{6}$$

$$x = -\frac{1}{3} - \frac{\sqrt{2}}{3}i$$

$$x = \frac{-2 \pm \sqrt{-8}}{6}$$

$$\text{note } \sqrt{-8} = \sqrt{-1 \cdot 8}$$

$$= \sqrt{-1} \sqrt{(4) \cdot 2}$$

$$= i \sqrt{(4)} \sqrt{2}$$

$$i \cdot 2\sqrt{2}$$

$$2\sqrt{2}i$$