

10E

1) 6

$$2) X^5 + 5X^4(-4) + 10X^3(-4)^2 + 10X^2(-4)^3 + 5X(-4)^4 + (-4)^5$$

$$X^5 - 20X^4 + 160X^3 - 640X^2 + 1280X - 1,024$$

3) 5

$$4) X^4 + 4X^3 \cdot 2 + 6X^2 \cdot 2^2 + 4X \cdot 2^3 + 2^4$$

$$X^4 + 8X^3 + 24X^2 + 32X + 16$$

$$5) \frac{5^2}{1 \cdot 2 \cdot 3} (2X)^2 3^3 = (10)4X^2(27) = 1080X^2$$

$$6) \frac{5}{1} (2X)^4 3^1 = (5)16X^4(3) = 240X^4$$

$$7) (2X)^4 = 16X^4$$

$$8) \frac{4 \cdot 3}{1 \cdot 2} (2X)^2 1^2 = (6)4X^2(1) = 24X^2$$

$$9) X^2 + 2XA + A^2$$

$$10) (6X - 1/2)^2$$

$$11) X^3 + 3X^2(4/5) + 3X(4/5)^2 + (4/5)^3$$

$$X^3 + 12/5 X^2 + 48/25 X + 64/125$$

$$12) (3X)^3 + 3(3X)^2 + 3(3X) + 1^3$$

$$27X^3 + 27X^2 + 9X + 1$$

$$13) \frac{\sqrt{8}(5\sqrt{7}+4)}{(5\sqrt{7}-4)(5\sqrt{7}+4)} =$$

$$\frac{5\sqrt{56} + 4\sqrt{8}}{25 \cdot 7 - 16} =$$

$$\frac{5\sqrt{4}\sqrt{14} + 4\sqrt{4}\sqrt{2}}{159} = \frac{10\sqrt{14} + 8\sqrt{2}}{159}$$

$$14) \frac{-3i(2+11i)}{(2-11i)(2+11i)} = \frac{-6-33i^2}{4-121i^2} =$$

$$\frac{-6+i+33}{125}$$

$$15) -30i$$

$$16) (-35)(-\sqrt{16}) = -35 \cdot -4 = 140$$

$$17) \sqrt{\frac{1}{10}} + 3\sqrt{90} =$$

$$\frac{\sqrt{1}\sqrt{10}}{\sqrt{10}\sqrt{10}} + \frac{3\sqrt{90}(10)}{(10)} = \frac{\sqrt{10}}{10} + \frac{30\sqrt{90}}{10} =$$

$$\frac{\sqrt{10}}{10} + \frac{30\sqrt{9}\sqrt{10}}{10} = \frac{\sqrt{10} + 90\sqrt{10}}{10} =$$

$$\frac{91\sqrt{10}}{10}$$

$$18) (9)^{3/2} = 27$$

$$19) \frac{(X+2)(\cancel{X+3})}{(X-4)(\cancel{X+4})} \cdot \frac{(X+2)(\cancel{X+4})}{(\cancel{X+3})(X+3)} =$$

$$\frac{X^2 + 4X + 4}{X^2 - X - 12}$$

$$20) 12X^4Y^5 + \frac{10X^4}{Y^5} + 8X^4Y^5 =$$

$$\frac{10X^4}{Y^5} + 20X^4Y^5$$

11A

1) 25

2) 16

3) 4X

4) 30A

$$5) X^2 + 2X + 1 = -3 + 1$$

$$(X+1)^2 = -2$$

$$X+1 = \pm\sqrt{-2}$$

$$X = -1 \pm i\sqrt{2}$$

$$6) X^2 - 5X + 4 = 0$$

$$(X-4)(X-1) = 0$$

$$X-4=0 \quad X-1=0$$

$$X=4 \quad X=1$$

$$7) 2(X^2 + 4X + 1) = 0$$

$$X^2 + 4X + 4 = -1 + 4$$

$$(X+2)^2 = 3$$

$$X+2 = \pm\sqrt{3}$$

$$X = -2 \pm \sqrt{3}$$

$$8) X^2 + 4X + 4 = 7 + 4$$

$$(X+2)^2 = 11$$

$$X+2 = \pm\sqrt{11}$$

$$X = -2 \pm \sqrt{11}$$

$$9) 3(X^2 - 3X + 1) = 0$$

$$X^2 - 3X + \frac{9}{4} = -1 + \frac{9}{4}$$

$$(X - \frac{3}{2})^2 = \frac{5}{4}$$

$$X - \frac{3}{2} = \pm\sqrt{\frac{5}{4}}$$

$$X = \frac{3}{2} \pm \frac{\sqrt{5}}{2} \text{ or } \frac{3 \pm \sqrt{5}}{2}$$

$$10) X^2 - 2X + 1 = 11 + 1$$

$$(X-1)^2 = 12$$

$$X-1 = \sqrt{12}$$

$$X = 1 \pm 2\sqrt{3}$$

For most problems, the check for only one solution is shown.
The check for the other solution should be similar.

$$(-1 + i\sqrt{2})^2 + 2(-1 + i\sqrt{2}) + 3 = 0$$

$$1 - 2i\sqrt{2} - 2 - 2 + 2i\sqrt{2} + 3 = 0$$

$$1 - 2 - 2 + 3 = 0$$

$$(4)^2 - 5(4) + 4 = 0$$

$$16 - 20 + 4 = 0$$

$$(1)^2 - 5(1) + 4 = 0$$

$$1 - 5 + 4 = 0$$

$$[2(-2 + \sqrt{3})^2 + 8(-2 + \sqrt{3}) + 2 = 0] \div 2$$

$$(-2 + \sqrt{3})^2 + 4(-2 + \sqrt{3}) + 1 = 0$$

$$4 - 4\sqrt{3} + 3 - 8 + 4\sqrt{3} + 1 = 0$$

$$4 + 3 - 8 + 1 = 0$$

$$(-2 + \sqrt{11})^2 + 4(-2 + \sqrt{11}) - 7 = 0$$

$$4 - 4\sqrt{11} + 11 - 8 + 4\sqrt{11} - 7 = 0$$

$$4 + 11 - 8 - 7 = 0$$

$$[3(\frac{3+2\sqrt{5}}{2})^2 - 9(\frac{3+\sqrt{5}}{2}) + 3 = 0] \div 3$$

$$[\frac{9+6\sqrt{5}+5}{4} - \frac{9+3\sqrt{5}}{2} + 1 = 0] \times 4$$

$$9 + 6\sqrt{5} + 5 - 18 - 6\sqrt{5} + 4 = 0$$

$$9 + 5 - 18 + 4 = 0$$

$$(1 + 2\sqrt{3})^2 - 2(1 + 2\sqrt{3}) - 11 = 0$$

$$1 + 4\sqrt{3} + 12 - 2 - 4\sqrt{3} - 11 = 0$$

$$1 + 12 - 2 - 11 = 0$$

11B

1) $9/4$

2) $1/36$

3) $2X$

4) $4/5Y$

5) $X^2 + 4X + 4 = -16 + 4$
 $(X + 2)^2 = -12$
 $X + 2 = \pm\sqrt{-12}$
 $X = -2 \pm 2i\sqrt{3}$

6) $2(X^2 - 8X - 2) = 0$
 $X^2 - 8X + 16 = 2 + 16$
 $(X - 4)^2 = 18$
 $X - 4 = \pm\sqrt{18}$
 $X = 4 \pm 3\sqrt{2}$

7) $A^2 + 5A + 25/4 = -1/4 + 25/4$
 $(A + 5/2)^2 = 6$
 $A + 5/2 = \pm\sqrt{6}$
 $A = -5/2 \pm \sqrt{6}$

8) $X^2 + 8X + 16 = 10 + 16$
 $(X + 4)^2 = 26$
 $X + 4 = \pm\sqrt{26}$
 $X = -4 \pm \sqrt{26}$

9) $X^2 + 6X + 1 = 0$
 $X^2 + 6X + 9 = -1 + 9$
 $(X + 3)^2 = 8$
 $X + 3 = \pm\sqrt{8}$
 $X = -3 \pm 2\sqrt{2}$

10) $X^2 - 10X + 25 = -30 + 25$
 $(X - 5)^2 = -5$
 $X - 5 = \pm\sqrt{-5}$
 $X = 5 \pm i\sqrt{5}$

The check for only one solution is shown for these problems.
 The check for the other solution should be similar.

$(-2 + 2i\sqrt{3})^2 + 4(-2 + 2i\sqrt{3}) + 16 = 0$
 $4 - 8i\sqrt{3} - 12 - 8 + 8i\sqrt{3} + 16 = 0$
 $4 - 12 - 8 + 16 = 0$

$[2(4 + 3\sqrt{2})^2 - 16(4 + 3\sqrt{2}) - 4] \div 2$
 $(4 + 3\sqrt{2})^2 - 8(4 + 3\sqrt{2}) - 2 = 0$
 $16 + 24\sqrt{2} + 18 - 32 - 24\sqrt{2} - 2 = 0$
 $16 + 18 - 32 - 2 = 0$

$(-5/2 + \sqrt{6})^2 + 5(-5/2 + \sqrt{6}) + 1/4 = 0$
 $25/4 - 5\sqrt{6} + 6 - 25/2 + 5\sqrt{6} + 1/4 = 0$
 $25/4 + 24/4 - 50/4 + 1/4 = 0$

$(-4 + \sqrt{26})^2 + 8(-4 + \sqrt{26}) - 10 = 0$
 $16 - 8\sqrt{26} + 26 - 32 + 8\sqrt{26} - 10 = 0$
 $16 + 26 - 32 - 10 = 0$

$[3(-3 + 2\sqrt{2})^2 + 18(-3 + 2\sqrt{2}) + 3] \div 3$
 $9 - 12\sqrt{2} + 8 - 18 + 12\sqrt{2} + 1 = 0$
 $9 + 8 - 18 + 1 = 0$

$(5 + i\sqrt{5})^2 - 10(5 + i\sqrt{5}) + 30 = 0$
 $25 + 10i\sqrt{5} - 5 - 50 - 10i\sqrt{5} + 30 = 0$
 $25 - 5 - 50 + 30 = 0$

11C

1) $4X^2 + 4/3 X + 1/9$

2) $9X^2 - 24X + 16$

3) 9

4) $2X^2 + 20X + \underline{\hspace{2cm}}$
 $X^2 + 10X + \underline{\hspace{2cm}}$
 $X^2 + 10X + 25$
 $2X^2 + 20X + 50$

5) $28X$

6) $3/2 X$

7) $X^2 + 10X + 25 = -3 + 25$
 $\sqrt{(X + 5)^2} = \sqrt{22}$
 $X + 5 = \pm\sqrt{22}$
 $X = -5 \pm \sqrt{22}$

8) $(-5 + \sqrt{22})^2 + 10(-5 + \sqrt{22}) + 3 = 0$
 $25 - 10\sqrt{22} + 22 - 50 + 10\sqrt{22} + 3 = 0$
 $(-5 - \sqrt{22})^2 + 10(-5 - \sqrt{22}) + 3 = 0$
 $25 + 10\sqrt{22} + 22 - 50 - 10\sqrt{22} + 3 = 0$

9) $X^2 - 6X = 6$ $\sqrt{(X - 3)^2} = \sqrt{15}$
 $X^2 - 6X + 9 = 6 + 9$ $X - 3 = \pm\sqrt{15}$
 $(X - 3)^2 = 15$ $X = 3 \pm \sqrt{15}$

10) $(3 + \sqrt{15})^2 + 6(3 + \sqrt{15}) - 6 = 0$
 $9 + 6\sqrt{15} + 15 - 18 - 6\sqrt{15} - 6 = 0$
 $24 - 24 = 0$
 $(3 - \sqrt{15})^2 + 6(3 - \sqrt{15}) - 6 = 0$
 $9 - 6\sqrt{15} + 15 - 18 + 6\sqrt{15} - 6 = 0$
 $24 - 24 = 0$

11) $(1/2 X)^4 + 4(1/2 X)^3(-3B) + 6(1/2 X)^2(-3B)^2 +$
 $4(1/2 X)(-3B)^3 + (-3B)^4 =$
 $1/16 X^4 - 3/2 X^3B + 27/2 X^2B^2 - 54XB^3 + 81B^4$

12) $X^5 + 5X^4 + 10X^3 + 10X^2 + 5X + 1$

13) $\frac{5 \cdot 4}{1 \cdot 2} (2X)^3(-5)^2 = 10 \cdot 8^3 X \cdot 25 =$
 $2000X^3$

14) $\frac{5 \cdot 4 \cdot 3 \cdot 2}{1 \cdot 2 \cdot 3 \cdot 4} (2X)^1(-5)^4 = 5 \cdot 2X \cdot 625 =$
 $6250X$

15) $(4X)^3 + 3(4X)^2(-6) + 3(4X)(-6)^2 + (-6)^3 =$
 $64X^3 - 288X^2 + 432X - 216$

16) $(X + 4)$

17) $\frac{(5 - 6\sqrt{3})}{(4i + 7)} = \frac{(5 - 6i\sqrt{3})(4i - 7)}{(4i + 7)(4i - 7)} =$
 $\frac{20i - 35 - 24i^2\sqrt{3} + 42i\sqrt{3}}{16i^2 - 49} =$
 $\frac{20i - 35 + 24\sqrt{3} + 42i\sqrt{3}}{-65}$

18) $\frac{(3 - \sqrt{2})(3 - \sqrt{2})}{(3 + \sqrt{2})(3 - \sqrt{2})} =$
 $\frac{9 - 6\sqrt{2} + 2}{9 - 2} = \frac{11 - 6\sqrt{2}}{7}$

19) $(12i)(i\sqrt{5} - 4) = 12i^2\sqrt{5} - 48i =$
 $-12\sqrt{5} - 48i$

20) $i^4 = i^2 \times i^2 = (-1)(-1) = 1$

11D

1) $\frac{1}{4}X^2 - 5X + 25$

2) $4X^2 - 24X + 36$

3) 49

4) 64

5) 6X

6) 16X

7) $X^2 - 4X + 4 = -5 + 4$

$(X - 2)^2 = -1$

$\sqrt{(X - 2)^2} = \sqrt{-1}$

$X - 2 = \pm i$

$X = 2 \pm i$

8) $(2 + i)^2 - 4(2 + i) + 5 = 0$

$4 + 4i + i^2 - 8 - 4i + 5 = 0$

$4 - 1 - 8 + 5 = 0$

$(2 - i)^2 - 4(2 - i) + 5 = 0$

$4 - 4i + i^2 - 8 + 4i + 5 = 0$

$4 - 1 - 8 + 5 = 0$

9) $(X + 11)(X + 1) = 0$

$X = -11, -1$

10) $(-11)^2 + 12(-11) + 11 = 0$

$121 - 132 + 11 = 0$

$(-1)^2 + 12(-1) + 11 = 0$

$1 - 12 + 11 = 0$

11) $(\frac{1}{3}X)^4 + 4(\frac{1}{3}X)^3(2) + 6(\frac{1}{3}X)^2(2)^2 + 4(\frac{1}{3}X)(2)^3 + 2^4 =$

$\frac{1}{81}X^4 + \frac{8}{27}X^3 + \frac{8}{3}X^2 + \frac{32}{3}X + 16$

12) $X^5 + 5X^4(-2A) + 10X^3(-2A)^2 + 10X^2(-2A)^3 + 5X(-2A)^4 + (-2A)^5 =$

$X^5 - 18X^4A + 40X^3A^2 - 80X^2A^3 + 80XA^4 - 32A^5$

13) $\frac{5}{1}(X)^4(2A)^1 = 10X^4A$

14) $(2A)^5 = 32A^5$

15) $(2X)^3 + 3(2X)^2(-3)^1 + 3(2X)(-3)^2 + (-3)^3 =$
 $8X^3 - 36X^2 + 54X - 27$

16) $(X - 3)$

17) $\frac{(4i\sqrt{6})(8i + 9)}{(8i - 9)(8i + 9)} =$

$\frac{32i^2\sqrt{6} + 36i\sqrt{6}}{64i^2 - 81} =$

$\frac{-32\sqrt{6} + 36i\sqrt{6}}{-145}$

18) $\frac{(5 + \sqrt{-3})(5 + \sqrt{-3})}{(5 - \sqrt{-3})(5 + \sqrt{-3})} =$

$\frac{25 + 10\sqrt{-3} - 3}{25 - (-3)} = \frac{22 + 10i\sqrt{3}}{28}$

$\frac{11 + 5i\sqrt{3}}{14}$

19) $(4i)(2i - 3i) = (4i)(-i) = -4i^2 = 4$

20) $(1)(1) = 1$

11E

1) $9X^2 - 3/2X + 1/16$

2) $X^2 + 22X + 121$

3) 16

4) 225

5) 12X

6) $4X^2 + \underline{\hspace{2cm}} + 9$

$X^2 + \underline{\hspace{2cm}} + 9/4$

$X^2 + 6/2X + 9/4$

$4X^2 + 12X + 9$

7) $X^2 - 3X + 9/4 = 9 + 9/4$

$(X - 3/2)^2 = 45/4$

$\sqrt{(X - 3/2)^2} = \sqrt{45/4}$

$X - 3/2 = \pm \frac{3\sqrt{5}}{2}$

$X = \frac{3 \pm 3\sqrt{5}}{2}$

8) $[3/2 + (3/2)\sqrt{5}]^2 - 3[3/2 + (3/2)\sqrt{5}] - 9 = 0$

$9/4 + \cancel{(9/2)\sqrt{5}} + (9/4)5 - 9/2 - \cancel{(9/2)\sqrt{5}} - 18/2 = 0$

$27/2 - 9/2 - 18/2 = 0$

$[3/2 - (3/2)\sqrt{5}]^2 - 3[3/2 - (3/2)\sqrt{5}] - 9 = 0$

$9/4 - \cancel{(9/2)\sqrt{5}} + (9/4)5 - 9/2 + \cancel{(9/2)\sqrt{5}} - 18/2 = 0$

$27/2 - 9/2 - 18/2 = 0$

9) $(2X - 1)(X + 2) = 0$

$X = 1/2, -2$

10) $2(1/2)^2 + 3(1/2) - 2 = 0$

$1/2 + 3/2 - 4/2 = 0$

$2(-2)^2 + 3(-2) - 2 = 0$

$8 - 6 - 2 = 0$

11) $X^5 + 5X^4(2) + 10X^3(2)^2 + 10X^2(2)^3 + 5X(2)^4 + 2^5 =$

$X^5 + 10X^4 + 40X^3 + 80X^2 + 80X + 32$

12) $(2X)^4 + 4(2X)^3(-1) + 6(2X)^2(-1)^2 + 4(2X)(-1)^3 + (-1)^4 =$

$16X^4 - 32X^3 + 24X^2 - 8X + 1$

13) $\frac{6 \cdot 5}{1 \cdot 2}(X)^4(-1)^2 = 15X^4$

14) $\frac{6 \cdot 5 \cdot 4}{1 \cdot 2 \cdot 3}X^3(-1)^3 = -20X^3$

15) $(3X)^3 + 3(3X)^2(1) + 3(3X)(1)^2 + 1^3 =$
 $27X^3 + 27X^2 + 9X + 1$

16) $(X + 5)$

17) $\frac{(3 - 2i\sqrt{5})(7i - 2)}{(7i + 2)(7i - 2)} =$

$\frac{21i - 14i^2\sqrt{5} - 6 + 4i\sqrt{5}}{49i^2 - 4} =$

$\frac{21i + 14\sqrt{5} - 6 + 4i\sqrt{5}}{-53}$

18) $\frac{(1 + \sqrt{X})(2 + \sqrt{X})}{(2 - \sqrt{X})(2 + \sqrt{X})} =$

$\frac{2 + 3\sqrt{X} + X}{4 - X}$

19) $18i(6i + 7i) = 18i(13i) = 234i^2 = -234$

20) $(i^2)(i^2)(i^2) = (-1)^3 = -1$