

10A

1) 7 terms

$$1A^67^0 + 6A^57^1 + 15A^47^2 + 20A^37^3 + 15A^27^4 + 6A^17^5 + 1A^07^6$$

$$A^6 + 42A^5 + 735A^4 + 6860A^3 + 36,015A^2 + 100,842A + 117,649$$

2) 6 terms

$$1X^5(-2)^0 + 5X^4(-2)^1 + 10X^3(-2)^2 + 10X^2(-2)^3 + 5X^1(-2)^4 + 1X^0(-2)^5$$

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

3) 5 terms

$$1(3X)^41^0 + 4(3X)^31^1 + 6(3X)^21^2 + 4(3X)^11^3 + 1(3X)^01^4$$

$$81X^4 + 108X^3 + 54X^2 + 12X + 1$$

4) 7 terms

$$1R^6(-1/2)^0 + 6R^5(-1/2)^1 + 15R^4(-1/2)^2 + 20R^3(-1/2)^3 + 15R^2(-1/2)^4 + 6R^1(-1/2)^5 + 1R^0(-1/2)^6$$

$$R^6 - 3R^5 + 15/4 R^4 - 5/2 R^3 + 15/16 R^2 - 3/16 R + 1/64$$

$$5) \frac{5 \cdot \cancel{A} \cdot \cancel{B}}{1 \cdot \cancel{A} \cdot \cancel{B}} = 10 \quad 10A^2(2B)^3 = 80A^2B^3$$

$$6) \frac{\cancel{B} \cdot 5}{1 \cdot \cancel{B}} = 15 \quad 15X^42^2 = 60X^4$$

$$7) \frac{\cancel{B} \cdot \cancel{B} \cdot 5 \cdot \cancel{A}}{1 \cdot \cancel{B} \cdot \cancel{B} \cdot \cancel{A}} = 35 \quad 35(2X)^3(-2)^4 = 4,480X^3$$

$$8) \frac{4}{1} = 4 \quad 4X^3(-1/3)^1 = -4/3 X^3$$

$$9) \frac{\cancel{B} \cdot 5 \cdot \cancel{A}}{1 \cdot \cancel{B} \cdot \cancel{A}} = 20 \quad 20X^3Y^3$$

$$10) \frac{\cancel{B} \cdot \cancel{B} \cdot \cancel{B} \cdot \cancel{A}}{1 \cdot \cancel{B} \cdot \cancel{B} \cdot \cancel{A}} = 56 \quad 56P^3(-Q)^5 = -56P^3Q^5$$

10B

1) 4 terms

$$1B^34^0 + 3B^24^1 + 3B^14^2 + 1B^04^3$$

$$B^3 + 12B^2 + 48B + 64$$

2) 7 terms

$$1(2X)^61^0 + 6(2X)^51^1 + 15(2X)^41^2 + 20(2X)^31^3 + 15(2X)^21^4 + 6(2X)^11^5 + 1(2X)^01^6$$

$$64X^6 + 192X^5 + 240X^4 + 160X^3 + 60X^2 + 12X + 1$$

3) 6 terms

$$1R^5(-T)^0 + 5R^4(-T)^1 + 10R^3(-T)^2 + 10R^2(-T)^3 + 5R^1(-T)^4 + 1R^0(-T)^5$$

$$R^5 - 5R^4T + 10R^3T^2 - 10R^2T^3 + 5RT^4 - T^5$$

4) 5 terms

$$1(1/2 X)^4(1/2 Y)^0 + 4(1/2 X)^3(1/2 Y)^1 + 6(1/2 X)^2(1/2 Y)^2 + 4(1/2 X)^1(1/2 Y)^3 + 1(1/2 X)^0(1/2 Y)^4$$

$$1/16 X^4 + 1/4 X^3Y + 3/8 X^2Y^2 + 1/4 XY^3 + 1/16 Y^4$$

$$5) 1X^{10}(2Y)^0 = X^{10}$$

$$6) \frac{\cancel{B} \cdot \cancel{B} \cdot \cancel{A} \cdot \cancel{B} \cdot \cancel{B} \cdot 1}{1 \cdot \cancel{B} \cdot \cancel{B} \cdot \cancel{A} \cdot \cancel{B} \cdot \cancel{B}} = 1 \quad 1A^0B^6 = B^6$$

$$7) \frac{\cancel{B} \cdot 3}{1 \cdot \cancel{B}} = 6 \quad 6(2X)^23^2 = 216X^2$$

$$8) \frac{\cancel{B} \cdot 5 \cdot \cancel{A} \cdot \cancel{B}}{1 \cdot \cancel{B} \cdot \cancel{B} \cdot \cancel{A}} = 15 \quad 15Q^2(2/3)^4 = 80/27 Q^2$$

$$9) \frac{5}{1} = 5 \quad 5(3R)^4(-T)^1 = -405R^4T$$

$$10) \frac{4 \cdot \cancel{B} \cdot \cancel{B}}{1 \cdot \cancel{B} \cdot \cancel{B}} = 4 \quad 4(2X)^1(-2Y)^3 = -64XY^3$$

10C

1) 6

$$2) 1X^5 3^0 + 5X^4 3^1 + 10X^3 3^2 + 10X^2 3^3 + 5X^1 3^4 + 1X^0 3^5 \\ X^5 + 15X^4 + 90X^3 + 270X^2 + 405X + 243$$

3) 7

$$4) 1X^6(-4)^0 + 6X^5(-4)^1 + 15X^4(-4)^2 + 20X^3(-4)^3 + \\ 15X^2(-4)^4 + 6X(-4)^5 + (-4)^6 \\ X^6 - 24X^5 + 240X^4 - 1280X^3 + 3840X^2 - 6144X + 4096$$

$$5) 4(2X)^1 Y^3 = 8XY^3$$

$$6) 4(2X)^3 Y = 32X^3 Y$$

$$7) 15(X)^4(-2)^2 = 60X^4$$

$$8) 15(X)^2(-2)^4 = 240X^2$$

$$9) X^2 + 6AX + 9A^2$$

$$10) (3X - 7)^2$$

$$11) X^3 + 3X^2(12) + 3X(12^2) + 12^3 \\ X^3 + 36X^2 + 432X + 1728$$

$$12) (2X)^3 + 3(2X)^2(-1/3) + 3(2X)(-1/3)^2 + (-1/3)^3 \\ 8X^3 - 4X^2 + 2/3X - 1/27$$

$$13) \frac{(2\sqrt{2} + 1)(3\sqrt{3} + 1)}{(3\sqrt{3} - 1)(3\sqrt{3} + 1)} =$$

$$\frac{6\sqrt{6} + 2\sqrt{2} + 3\sqrt{3} + 1}{9 \cdot 3 - 1} = \\ \frac{6\sqrt{6} + 2\sqrt{2} + 3\sqrt{3} + 1}{26}$$

$$14) \frac{-8i(4 - 5i)}{4 + 5i(4 - 5i)} = \frac{-32i + 40i^2}{16 - 25i^2} = \frac{-32i - 40}{41}$$

$$15) (-616)(i^3) = (-616)(i^2)(i) = 616i$$

$$16) (-12)(\sqrt{-36}) = -12(\sqrt{36}\sqrt{-1}) = \\ -12 \cdot 6 \cdot i = -72i$$

$$17) 6\sqrt{\frac{1}{2}} - \frac{9\sqrt{8}}{2} = \\ \frac{6\sqrt{1}\sqrt{2}}{\sqrt{2}\sqrt{2}} - \frac{9\sqrt{4}\sqrt{2}}{2} = \\ \frac{6\sqrt{2}}{2} - \frac{18\sqrt{2}}{2} = -6\sqrt{2}$$

$$18) (4)^{5/2} = 32$$

$$19) \frac{2X^2 - 3X - 2}{X^3 - 2X^2} \div \frac{4X^2 - 12X}{X^2 - 5X + 6} = \\ \frac{(2X + 1)(X - 2)}{X^2(X - 2)} \cdot \frac{(X - 3)(X - 2)}{4X(X - 3)} = \\ \frac{2X^2 - 3X - 2}{4X^3}$$

$$20) \frac{10X}{Y} - \frac{Y}{4X} - \frac{2Y(4)}{X(4)} = \frac{10X}{Y} - \frac{9Y}{4X}$$

10D

1) 6

$$2) X^5 + 5X^4A + 10X^3A^2 + 10X^2A^3 + 5XA^4 + A^5$$

3) 5

$$4) (1/3X)^4 + 4(1/3X)^3 2 + 6(1/3X)^2 2^2 + 4(1/3X) 2^3 + 2^4 \\ 1/81 X^4 + 8/27 X^3 + 8/3 X^2 + 32/3 X + 16$$

$$5) \frac{6 \cdot 5 \cdot 4}{1 \cdot 2 \cdot 3} X^3(-2/3)^3 = -160/27 X^3$$

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

$$7) \frac{5 \cdot 4}{1 \cdot 2} X^3(-3)^2 = 90X^3$$

$$8) \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{1 \cdot 2 \cdot 3 \cdot 4 \cdot 5} X^0(-3)^5 = -243$$

$$9) X^2 - 4AX + 4A^2$$

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

$$11) X^3 + 3X^2(-10) + 3X(-10)^2 + (-10)^3 \\ X^3 - 30X^2 + 300X - 1000$$

$$12) X^3 + 3X^2(1/2) + 3(X)(1/2)^2 + (1/2)^3 \\ X^3 + 3/2 X^2 + 3/4 X + 1/8$$

$$13) \frac{(8\sqrt{11} - 6)(4\sqrt{2} - 3)}{(4\sqrt{2} + 3)(4\sqrt{2} - 3)} =$$

$$\frac{32\sqrt{22} - 24\sqrt{11} - 24\sqrt{2} + 18}{16 \cdot 2 - 9} = \\ \frac{32\sqrt{22} - 24\sqrt{11} - 24\sqrt{2} + 18}{23}$$

$$14) \frac{2i(1 - 9i)}{(1 + 9i)(1 - 9i)} = \frac{2i - 18i^2}{1 - 81i^2} = \frac{2i + 18}{82} = \\ \frac{i + 9}{41}$$

$$15) 540i^2 = -540$$

$$16) (72)(-7) = -504$$

$$17) \sqrt{\frac{5}{8}} - 2\sqrt{160} = \\ \frac{\sqrt{5}\sqrt{2}}{\sqrt{8}\sqrt{2}} - 2\sqrt{16}\sqrt{10} = \frac{\sqrt{10}}{4} - 8\sqrt{10} \\ \frac{\sqrt{10}}{4} - \frac{32\sqrt{10}}{4} = \frac{-31\sqrt{10}}{4}$$

$$18) (5)^3 = 125 \text{ or} \\ [(125)^{1/3}]^3 = 125^1 = 125$$

$$19) \frac{4X^2 - 1}{2X + 1} \div \frac{4X^2 - 4X + 1}{8X} = \\ \frac{(2X - 1)(2X + 1)}{(2X + 1)} \cdot \frac{8X}{(2X - 1)(2X - 1)} = \\ \frac{8X}{2X - 1}$$

$$20) 4X + 6Y + 9XY^5$$

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

$$4) X^4 + 4X^3 + 6X^2 + 4X + 1 \\ X^4 + 8X^3 + 24X^2 + 32X + 16$$

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

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

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

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

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

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

$$11) X^3 + 3X^2(4/5) + 3X(4/5)^2 + (4/5)^3 \\ X^3 + 12/5 X^2 + 48/25 X + 64/125$$

$$12) (3X)^3 + 3(3X)^2 + 3(3X) + 1^3 \\ 27X^3 + 27X^2 + 9X + 1$$

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

$$\frac{5\sqrt{56} + 4\sqrt{8}}{25 \cdot 7 - 16} = \frac{5\sqrt{4} \sqrt{14} + 4\sqrt{4} \sqrt{2}}{159} = \frac{10\sqrt{14} + 8\sqrt{2}}{159}$$

$$14) \frac{-3i(2 + 11i)}{(2 - 11i)(2 + 11i)} = \frac{-6 - 33i^2}{4 - 121i^2} = \frac{-6i + 33}{125}$$

$$15) -30i$$

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

$$17) \sqrt{\frac{1}{10}} + 3\sqrt{90} = \frac{\sqrt{1} \cdot \sqrt{10}}{\sqrt{10} \cdot \sqrt{10}} + \frac{3\sqrt{90}(10)}{(10)} = \frac{\sqrt{10}}{10} + \frac{30\sqrt{90}}{10} = \frac{\sqrt{10}}{10} + \frac{30\sqrt{9} \sqrt{10}}{10} = \frac{\sqrt{10} + 90\sqrt{10}}{10} = \frac{91\sqrt{10}}{10}$$

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

$$19) \frac{(X+2)(\cancel{X+3})}{(X-4)(\cancel{X+4})} \cdot \frac{(X+2)(\cancel{X+4})}{(\cancel{X+3})(X+3)} = \frac{X^2 + 4X + 4}{X^2 - X - 12}$$

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

11A

1) 25

2) 16

3) 4X

4) 30A

$$5) X^2 + 2X + 1 = -3 + 1 \\ (X+1)^2 = -2 \\ X+1 = \pm\sqrt{-2} \\ X = -1 \pm i\sqrt{2}$$

$$6) X^2 - 5X + 4 = 0 \\ (X-4)(X-1) = 0 \\ X-4 = 0 \quad X-1 = 0 \\ X = 4 \quad X = 1$$

$$7) 2(X^2 + 4X + 1) = 0 \\ X^2 + 4X + 4 = -1 + 4 \\ (X+2)^2 = 3 \\ X+2 = \pm\sqrt{3} \\ X = -2 \pm \sqrt{3}$$

$$8) X^2 + 4X + 4 = 7 + 4 \\ (X+2)^2 = 11 \\ X+2 = \pm\sqrt{11} \\ X = -2 \pm \sqrt{11}$$

$$9) 3(X^2 - 3X + 1) = 0 \\ X^2 - 3X + \frac{9}{4} = -1 + \frac{9}{4} \\ (X - \frac{3}{2})^2 = \frac{5}{4} \\ X - \frac{3}{2} = \pm \frac{\sqrt{5}}{2} \\ X = \frac{3}{2} \pm \frac{\sqrt{5}}{2} \text{ or } \frac{3 \pm \sqrt{5}}{2}$$

$$10) X^2 - 2X + 1 = 11 + 1 \\ (X-1)^2 = 12 \\ X-1 = \sqrt{12} \\ X = 1 \pm 2\sqrt{3}$$

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

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

$$(4)^2 - 5(4) + 4 = 0 \\ 16 - 20 + 4 = 0 \\ (1)^2 - 5(1) + 4 = 0 \\ 1 - 5 + 4 = 0$$

$$[2(-2 + \sqrt{3})^2 + 8(-2 + \sqrt{3}) + 2 = 0] \div 2 \\ (-2 + \sqrt{3})^2 + 4(-2 + \sqrt{3}) + 1 = 0 \\ 4 - 4\sqrt{3} + 3 - 8 + 4\sqrt{3} + 1 = 0 \\ 4 + 3 - 8 + 1 = 0$$

$$(-2 + \sqrt{11})^2 + 4(-2 + \sqrt{11}) - 7 = 0 \\ 4 - 4\sqrt{11} + 11 - 8 + 4\sqrt{11} - 7 = 0 \\ 4 + 11 - 8 - 7 = 0$$

$$[3(\frac{3 + 2\sqrt{5}}{2})^2 - 9(\frac{3 + \sqrt{5}}{2}) + 3 = 0] \div 3 \\ [\frac{9 + 6\sqrt{5} + 5}{4} - \frac{9 + 3\sqrt{5}}{2} + 1 = 0] \times 4 \\ 9 + 6\sqrt{5} + 5 - 18 - 6\sqrt{5} + 4 = 0 \\ 9 + 5 - 18 + 4 = 0$$

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