7E

1) $2i$

2) $11i$

3) Xi

4) $\frac{9}{2}i$

5) $4i + 5$

6) $9i + i = 10i$

7) $5\sqrt{4}\sqrt{3}\sqrt{-1} + 7\sqrt{25}\sqrt{3}\sqrt{-1} =$

$10i\sqrt{3} + 35i\sqrt{3} = 45i\sqrt{3}$

8) $200i^3 = 200(i^2)(i) = -200i$

9) $3i^4 = 3i^2 i^2 = 3(-i)(-i) = 3$

10) $(6 \cdot 5)(5\sqrt{16}\sqrt{-1}) = (30)(20)i = 600i$

11) $(X^2)(X^4) = X^6$

12) $(1)^2(X)^{1/3} = X^{1/3}$

13) $(2)^{-2} = \frac{1}{2^2} = \frac{1}{4}$

14) $[(64)^{1/2}]^{1/3} = 8^{1/3} = 2$

15) $[4/25X^2 = 1] \times 25$

$4X^2 = 25$

$4X^2 - 25 = 0$

$(2X - 5)(2X + 5) = 0$

$X = 5/2 \quad X = -5/2$

$4(5/2)^2 - 25 = 0$

$25 - 25 = 0$ ✓

$4(-5/2)^2 - 25 = 0$

$25 - 25 = 0$ ✓

16) $[9/4X^2 - 4 = 0] \times 4$

$9X^2 - 16 = 0$

$(3X - 4)(3X + 4) = 0$

$X = 4/3 \quad X = -4/3$

$9(4/3)^2 - 16 = 0$

$16 - 16 = 0$ ✓

$9(-4/3)^2 - 16 = 0$

$16 - 16 = 0$ ✓

17) $\frac{2X^2 + 2X - 4}{5X - 5} \div \frac{6X^2 - 6X - 36}{3X + 15} =$

$\frac{2(X + 2)(X - 1)}{5(X - 1)} \cdot \frac{3(X + 5)}{6(X - 3)(X + 2)} =$

$\frac{X + 5}{5X - 15}$

18) $\sqrt{\frac{4}{7}} - \sqrt{\frac{1}{4}} = \frac{\sqrt{4}}{\sqrt{7}} - \frac{\sqrt{1}}{\sqrt{4}} =$

$\frac{2\sqrt{7}}{\sqrt{7}\sqrt{7}} - \frac{1}{2} =$

$\frac{2\sqrt{7}(2)}{7(2)} - \frac{1(7)}{2(7)} = \frac{4\sqrt{7} - 7}{14}$

19) $\frac{(7 \times 10^{-7})(18 \times 10^{-4})}{(3 \times 10^{3})} =$

$\frac{42 \times 10^{-11}}{1 \times 10^{3}} = 42 \times 10^{-14} = 4.2 \times 10^{-13}$

20) $-\frac{4X}{A} - \frac{X}{A} + \frac{5}{A^2X} = \frac{-5X}{A} + \frac{5}{A^2X}$

8A

1) $A - B$

2) $3X + 8$

3) $6 - \sqrt{2}$

4) $1 + 5i$

5) $4B^2 - 16$

6) $9 - 4i^2 = 9 + 4 = 13$

7) $4 - 49i^2 = 4 + 49 = 53$

8) $16 - 7 = 9$

9) $\frac{X(3 - 4i)}{(3 + 4i)(3 - 41)} = \frac{3X - 4Xi}{9 - 16i^2} =$

$\frac{3X - 4Xi}{9 + 16} = \frac{3X - 4Xi}{25}$

10) $\frac{11(2 - i)}{(2 + i)(2 - i)} = \frac{22 - 11i}{4 + 1} =$

$\frac{22 - 11i}{5}$

11) $\frac{4i(6 + 3i)}{(6 - 3i)(6 + 3i)} = \frac{24i + 12i^2}{36 + 9} =$

$\frac{8(8i - 4)}{45} = \frac{8i - 4}{15}$

12) $\frac{i^2(4 - 5i)}{(4 + 5i)(4 - 5i)} = \frac{4i^2 - 5i^3}{16 - 25i^2} =$

$\frac{-4 + 5i}{41}$

13) $\frac{Z}{(Z + \sqrt{5})} \frac{(Z - \sqrt{5})}{(Z - \sqrt{5})} = \frac{Z^2 - Z\sqrt{5}}{Z^2 - 5}$

14) $\frac{8(8 + \sqrt{8})}{(8 - \sqrt{8})(8 + \sqrt{8})} = \frac{64 + 8\sqrt{4(2)}}{64 - 8} =$

$\frac{64 + 16\sqrt{2}}{56} = \frac{8 + 2\sqrt{2}}{7}$

15) $\frac{7X(2 + 2\sqrt{X})}{(2 - 2\sqrt{X})(2 + 2\sqrt{X})} = \frac{14X + 14X\sqrt{X}}{4 - 4X} =$

$\frac{2(7X + 7X\sqrt{X})}{2(2 - 2X)} = \frac{7X + 7X\sqrt{X}}{2 - 2X}$

16) $\frac{3(8i - i\sqrt{2})}{(8i + i\sqrt{2})(8i - i\sqrt{2})} = \frac{24i - 3i\sqrt{2}}{64i^2 - 2i^2} =$

$\frac{24i - 3i\sqrt{2}}{-64 + 2} = \frac{24i - 3i\sqrt{2}}{-62}$

8B

1) $X^2 - Y^2$

2) $7X - 4$

3) $-3 + \sqrt{3}$

4) $5 - 3i^2$

5) $9 - 64X^2$

6) $36 - 9i^{10} = 36 + 9 = 45$

7) $4 - i^2 = 4 - (-1) = 5$

8) $16 - 25(2) = -34$

9) $\dfrac{A(4A - i)}{(4A + i)(4A - i)} = \dfrac{4A^2 - Ai}{16A^2 + 1}$

10) $\dfrac{9(3 + i)}{(3 - i)(3 + 1)} = \dfrac{27 + 9i}{9 - i^2} =$

$\dfrac{27 + 9i}{10}$

11) $\dfrac{7i^2(5 + 6i)}{(5 - 6i)(5 + 6i)} = \dfrac{35i^2 + 42i^3}{25 - 36i^2} =$

$\dfrac{-35 - 42i}{25 + 36} = \dfrac{-35 - 42i}{61}$

12) $\dfrac{3i(2 - 8i)}{(2 + 8i)(2 - 8i)} = \dfrac{6i - 24i^2}{4 - 64i^2} = \dfrac{6i + 24}{4 + 64} =$

$\dfrac{\cancel{6}^{3}i + \cancel{24}^{12}}{\cancel{68}_{34}} = \dfrac{3i + 12}{34}$

13) $\dfrac{X^2 \quad (X + \sqrt{4X})}{(X - \sqrt{4X})(X + \sqrt{4X})} = \dfrac{X^3 + X^2\sqrt{4X}}{X^2 - 4X} =$

$\dfrac{\cancel{X}(X^2 + 2X\sqrt{X})}{\cancel{X}(X - 4)} = \dfrac{X^2 + 2X\sqrt{X}}{X - 4}$

14) $\dfrac{4(4 - 2i)}{(4 + 2i)(4 - 2i)} = \dfrac{16 - 8i}{16 - 4i^2} =$

$\dfrac{\cancel{16}^{4} - \cancel{2i}^{2}}{\cancel{20}_{5}} = \dfrac{4 - 2i}{5}$

15) $\dfrac{(3X + \sqrt{2})(3X + \sqrt{2})}{(3X - \sqrt{2})(3X + \sqrt{2})} =$

$\dfrac{9X^2 + {}^{1}6X\sqrt{2} + 2}{9X^2 - 2}$

16) $\dfrac{5i(2i - i\sqrt{3})}{(2i + i\sqrt{3})(2i - i\sqrt{3})} = \dfrac{10i^2 - 5i^2\sqrt{3}}{4i^2 - 3i^2} =$

$\dfrac{-10 + 5\sqrt{3}}{-4 + 3} = \dfrac{-10 + 5\sqrt{3}}{-1} \dfrac{(-1)}{(-1)} =$

$\dfrac{10 - 5\sqrt{3}}{1} = 10 - 5\sqrt{3}$

8C

1) $3X + i$

2) $10 - 2\sqrt{7}$

3) $25 - 16i^2 = 25 + 16 = 41$

4) $9X^2 - 11$

5) $(2X + \sqrt{3})(2X - \sqrt{3})$

6) $X = \dfrac{\sqrt{3}}{2}, \ -\dfrac{\sqrt{3}}{2}$ or $X = \pm\dfrac{\sqrt{3}}{2}$

7) $(\sqrt{3}Y - 1/3)(\sqrt{3}Y + 1/3)$

8) $\sqrt{3}Y - \dfrac{1}{3} = 0 \qquad \sqrt{3}Y + \dfrac{1}{3} = 0$

$\sqrt{3}Y = \dfrac{1}{3} \qquad \sqrt{3}Y = \dfrac{-1}{3}$

$Y = \dfrac{1}{3\sqrt{3}} \qquad Y = \dfrac{-1}{3\sqrt{3}}$

$Y = \dfrac{\sqrt{3}}{9} \qquad Y = \dfrac{-\sqrt{3}}{9}$

9) $11\sqrt{4}\sqrt{3}\sqrt{-1} + 6\sqrt{3}\sqrt{-1} =$

$22i\sqrt{3} + 6i\sqrt{3} = 28i\sqrt{3}$

10) $(7i)(8i) = 56i^2 = 56(-1) = -56$

11) $12i \div 4i = 3$

12) $(-1)(-1) = 1$

13) $(27)^{-2} = \dfrac{1}{27^2} = \dfrac{1}{729}$

14) $[\,(X^8)^{1/4}\,]^{1/2} = (X^8)^{1/8} = X^1 = X$

15) $6X^2 + 7X + 2 = 0$

$(3X + 2)(2X + 1) = 0$

$X = -2/3 \qquad X = -1/2$

$6(-2/3)^2 + 7(-2/3) + 2 = 0$

$8/3 - 14/3 + 6/3 = 0$ ✓

$6(-1/2)^2 + 7(-1/2) + 2 = 0$

$3/2 - 7/2 + 4/2 = 0$ ✓

16) $9X^2 + 9X = 9X + 25$ $\qquad 9(5/3)^2 - 25 = 0$

$9X^2 - 25 = 0$ $\qquad 25 - 25 = 0$ ✓

$(3X - 5)(3X + 5) = 0$ $\qquad 9(-5/3)^2 - 25 = 0$

$X = 5/3 \qquad X = -5/3$ $\qquad 25 - 25 = 0$ ✓

17) $\dfrac{2X^2}{X^2 - 16} \div \dfrac{X}{4 - X} =$

$\dfrac{2X^{\cancel{2}}}{\cancel{(X-4)}(X + 4)} \cdot \dfrac{-\cancel{(X-4)}}{\cancel{X}} = \dfrac{-2X}{X + 4}$

18) $12\sqrt{\dfrac{1}{3}} - 9\sqrt{\dfrac{2}{5}} =$

$\dfrac{12\sqrt{1}\sqrt{3}}{\sqrt{3}\sqrt{3}} - \dfrac{9\sqrt{2}\sqrt{5}}{\sqrt{5}\sqrt{5}} =$

$\dfrac{12\sqrt{3}(5)}{3 \quad (5)} - \dfrac{9\sqrt{10}(3)}{5 \quad (3)} =$

$\dfrac{\cancel{60}^{20}\sqrt{3} - \cancel{27}^{9}\sqrt{10}}{\cancel{15}_{5}} = \dfrac{20\sqrt{3} - 9\sqrt{10}}{5}$

19) $\dfrac{\cancel{10}^{5}X^{-2}Y\,\cancel{Z^{4}}^{1}}{\cancel{4}_{2}X^{-1}\cancel{Z^{3}}Y^{-1}} = \dfrac{5Y^2Z^1}{2X}$ or $\dfrac{5}{2}X^{-1}Y^2Z^1$

20) $\dfrac{\dfrac{4Y}{Y} + \dfrac{X}{Y}}{\dfrac{2Y}{Y} - \dfrac{2X}{Y}} = \dfrac{\dfrac{4Y + X}{\cancel{X}} \cdot \dfrac{\cancel{X}}{2Y - 2X}}{\dfrac{2Y - 2X}{\cancel{X}} \cdot \dfrac{\cancel{X}}{2Y - 2X}} =$

$\dfrac{4Y + X}{2Y - 2X}$

8D

1) $4 - 8i$

2) $2 - 3\sqrt{91}$

3) $144 - 9i^2 = 144 + 9 = 153$

4) $X^2 - 2$

5) $(9X - \sqrt{3})(9X + \sqrt{3})$

6) $X = \frac{\sqrt{3}}{9}, \ -\frac{-\sqrt{3}}{9}$ or $X = \pm\frac{\sqrt{3}}{9}$

7) $(\sqrt{7}Y - 3)(\sqrt{7}Y + 3)$

8) $Y = \frac{3\sqrt{7}}{\sqrt{7}\sqrt{7}} = \frac{3\sqrt{7}}{7}$

$Y = \frac{-3\sqrt{7}}{\sqrt{7}\sqrt{7}} = \frac{-3\sqrt{7}}{7}$

$Y = \pm\frac{3\sqrt{7}}{7}$

9) $6i\sqrt{25}\sqrt{2} - 5i\sqrt{9}\sqrt{2}$
$30i\sqrt{2} - 15i\sqrt{2} = 15i\sqrt{2}$

10) $(5i)(2 \cdot 7i) = 70i^2 = -70$

11) $15i \div 3 = 5i$

12) $i^6 = i^2 \cdot i^2 \cdot i^2 = (-1)(-1)(-1) = -1$

13) $(9^{6/3}) = 9^2 = 81$

14) $(400^{1/2})^{-1} = 20^{-1} = \frac{1}{20}$

15) $5X^2 + 8X - 4 = 0$ $\quad 5(2/5))^2 + 8(2/5) - 4 = 0$
$(5X - 2)(X + 2) = 0$ $\quad 4/5 + 16/5 - 20/5 = 0$ ✓
$X = 2/5 \quad X = -2$ $\quad 5(-2)^2 + 8(-2) - 4 = 0$
$20 - 16 - 4 = 0$ ✓

16) $12X^2 - 7X - 12 = 0$
$(3X - 4)(4X + 3) = 0$
$X = 4/3 \quad X = -3/4$

$12(4/3)^2 - 7(4/3) - 12 = 0$
$64/3 - 28/3 - 36/3 = 0$ ✓
$12(-3/4)^2 - 7(-3/4) - 12 = 0$
$27/4 + 21/4 - 48/4 = 0$ ✓

17) $\frac{6X^2 + 3X}{4X^2 - 1} \div \frac{3X + 12}{2X^2 + X - 1} =$

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

18) $\sqrt{\frac{2}{X}} + \sqrt{\frac{3}{X}} = \frac{\sqrt{2}\sqrt{X}}{\sqrt{X}\sqrt{X}} + \frac{\sqrt{3}\sqrt{X}}{\sqrt{X}\sqrt{X}} =$

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

19) $5^3X^{-4}Y^4Z^{-2}$ or $\frac{125Y^4}{X^4Z^2}$

20) $\frac{\frac{5X}{X} - \frac{X-2}{X}}{\frac{2X^2}{2X} + \frac{5}{2X}} = \frac{\frac{5X - X + 2}{X} \cdot \frac{2X}{2X^2 + 5}}{\frac{2X^2 + 5}{2X} \cdot \frac{2X}{2X^2 + 5}} =$

$\frac{8X + 4}{2X^2 + 5}$

8E

1) $3 + 2i$

2) $4 + 5\sqrt{8}$

3) $A^2 - 196i^2 = A^2 + 196$

4) $4X^2 - 3$

5) $(4X - \sqrt{15})(4X + \sqrt{15})$

6) $X = \pm\frac{\sqrt{15}}{4}$

7) $5(X - \sqrt{2})(X + \sqrt{2})$

8) $X = \pm\sqrt{2}$

9) $11\sqrt{4}\sqrt{3}\sqrt{-1} + 6\sqrt{3}\sqrt{-1} =$
$22i\sqrt{3} + 6i\sqrt{3} = 28i\sqrt{3}$

10) $(-3i)(5 \cdot 9i) = -135i^2 = 135$

11) $14i \div 2i = 7$

12) 1

13) $(17^2)^{3/2} = 17^3$

14) $(4)^{3/2} = 8$

15) $[4/3X^2 = 4/3X + 5]\ 3$
$4X^2 - 4X - 15 = 0$
$(2X - 5)(2X + 3) = 0$
$X = 5/2 \quad X = -3/2$

$4(5/2)^2 - 4(5/2)) - 15 = 0$
$25 - 10 - 15 = 0$ ✓
$4(-3/2)^2 - 4(-3/2)) - 15 = 0$
$9 + 6 - 15 = 0$ ✓

16) $3X^2 + 7X + 2 = 0$
$(3X + 1)(X + 2) = 0$
$X = -1/3 \quad X = -2$

$3(-1/3)^2 + 7(-1/3) + 2 = 0$
$1/3 - 7/3 + 6/3 = 0$ ✓
$3(-2)^2 + 7(-2) + 2 = 0$
$12 - 14 + 2 = 0$ ✓

17) $\frac{X^2 + 2X - 24}{X^2 + 8X + 12} \div \frac{X^2 - 8X + 16}{X^2 + 4X + 4} =$

$\frac{(X+6)(X-4)}{(X+6)(X+2)} \cdot \frac{(X+2)(X+2)}{(X-4)(X-4)} = \frac{X + 2}{X - 4}$

18) $\sqrt{\frac{1}{2A}} - \sqrt{\frac{3}{2}} = \frac{\sqrt{1}\sqrt{2A}}{\sqrt{2A}\sqrt{2A}} - \frac{\sqrt{3}\sqrt{2}}{\sqrt{2}\sqrt{2}} =$

$\frac{\sqrt{2A}}{2A} - \frac{\sqrt{6}(A)}{2(A)} = \frac{\sqrt{2A} - A\sqrt{6}}{2A}$

19) $\frac{3^{-1}X^{-4}Y^3X^2}{3^0Y^{-1}Y^2} = \frac{Y^4X^2}{3^2X^4} = \frac{Y^2}{3X^2}$

20) $\frac{\frac{3X(3X)}{(3X)} + \frac{5X + 8}{3X}}{\frac{2X^2}{X^2} - \frac{4}{X^2}} = \frac{\frac{9X^2 + 5X + 8}{3X} \cdot \frac{X^2}{2X^2 - 4}}{\frac{2X^2 - 4}{X^2} \cdot \frac{X^2}{2X^2 - 4}}$

$\frac{9X^3 + 5X^2 + 8X}{6X^2 - 12}$