Mat 1033C
Chapter 8 - Roots & Radicals
practice for the exam
SOLUTIONS
10/2009

(1) $\sqrt{-324}$ not real
(A)

(2) $\sqrt{16}$ $= 4$
(B)

$2|16$, $2|8$, $2|4$, 2

(3) $\sqrt[3]{-125}$ $= -5$
(A)

$5|125$, $5|25$, 5

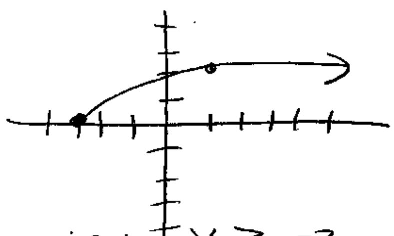
(4) $\sqrt[4]{\dfrac{81}{625}}$ $= \dfrac{3}{5}$
(C)

$3|81$, $3|27$, $3|9$, 3

$5|625$, $5|125$, $5|25$, 5

(5) $f(x) = \sqrt{x+3}$

x	y
-4	does not exist
-3	0
-2	1
-1	
0	
1	2

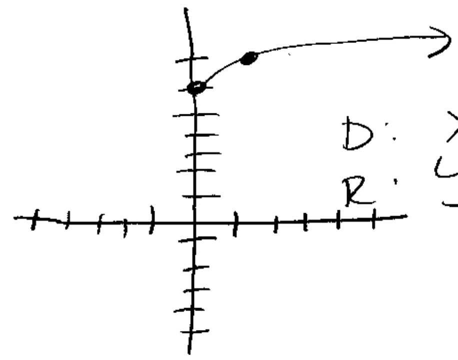


Domain: $x \geq -3$
Range: $y \geq 0$

$2|16$, $2|8$, $2|4$, 2

(6) $f(x) = \sqrt{x} + 6$

x	y
-1	Does not exist
0	6
1	7
4	8



D: $x \geq 0$
R: $y \geq 6$

(7) $\sqrt{x^6} = \sqrt{x\,x\;x\,x\;x\,x}$
(A) $= \boxed{x^3}$

(8) $\sqrt[3]{x^{21}} = x^7 = x^{21/3}$
(A)

(9) $\sqrt{3983} = \boxed{63.111}$
(B)

(10) $C = 300\sqrt[3]{n} + 1700$
(B) $n = 64$

$C = 300\sqrt[3]{64} + 1700$
$= 300(4) + 1700$
$= 1200 + 1700 = \boxed{\$2900}$

(11) $8^{4/3} = (8^{1/3})^4$
(A) $= (2)^4 = \boxed{16}$

(12) $2401^{1/4} = 7$
(B)

$7|2401$, $7|343$, $7|49$, 7

(13) $16^{5/4} = (16^{1/4})^5$
(D) $= (2)^5 = \boxed{32}$

(14) (A)

$$(-8)^{2/3} = \left[(-8)^{1/3}\right]^2 = (-2)^2 = \boxed{4}$$

(15) (A)

$$\left(\frac{25}{36}\right)^{-1/2} = \left(\frac{36}{25}\right)^{1/2} = \frac{\sqrt{36}}{\sqrt{25}} = \frac{6}{5}$$

(16) (A)

$$16^{-5/2} = \left(16^{1/2}\right)^{-5} = (4)^{-5} = \frac{1}{4^5} = \boxed{\frac{1}{1024}}$$

(17) (B)

$$\left(x^4y^4\right)^{1/5} = \boxed{x^{4/5}y^{4/5}} = \left(\sqrt[5]{xy}\right)^4$$

(18) (C)

$$\left(-\frac{27}{64}\right)^{-4/3} = \left(-\frac{64}{27}\right)^{4/3} = \left[\left(-\frac{64}{27}\right)^{1/3}\right]^4 = \left(-\frac{4}{3}\right)^4 = \boxed{\frac{256}{81}}$$

(19) (C)

$$\left(8m^4+2k^4\right)^{-2/5} = \frac{1}{\left(8m^4+2k^4\right)^{2/5}} = \boxed{\frac{1}{\sqrt[5]{\left(8m^4+2k^4\right)^2}}}$$

(C) (20)

$$\left(\frac{s^{-3/2}}{t^{-5/6}}\right)^3 \left(s^{-1/7}t^{1/7}\right)^{-3}$$

$$= \frac{s^{-9/2}}{t^{-5/\cancel{6}_2 \cdot \cancel{3}^1}} s^{3/7} t^{-3/7}$$

$$= \frac{s^{-9/2}}{t^{-5/2}} \cdot \frac{s^{3/7}}{t^{3/7}}$$

$$= \frac{s^{-9/2+3/7}}{t^{-5/2+3/7}} \quad \begin{matrix}\text{lcd } 14 \\ \text{lcd } 14\end{matrix}$$

$$= \frac{s^{-\frac{63}{14}+\frac{6}{14}}}{t^{-\frac{35}{14}+\frac{6}{14}}}$$

$$= \frac{s^{-57/14}}{t^{-29/14}}$$

$$= \frac{t^{29/14}}{s^{57/14}}$$

(21) $\dfrac{x^{3/5}}{x^{6/5}x^{-5}} = x^{3/5-6/5+5} = x^{22/5}$

(D)

$\frac{3}{5}-\frac{6}{5}+\frac{5}{1} = \frac{3}{5}-\frac{6}{5}+\frac{25}{5} = \frac{28-6}{5} = \frac{22}{5}$

(22) $\sqrt[4]{x^5}\cdot\sqrt[5]{x^2} = x^{5/4}x^{2/5} = x^{5/4+2/5} = x^{\frac{25+8}{20}}$

$= x^{33/20}$

(C)

(23) $\sqrt{\dfrac{x^3}{x^{10}}} = \sqrt{\dfrac{1}{x^7}} = \dfrac{1}{x^3\sqrt{x}} = \dfrac{1}{x^3\sqrt{x}}\cdot\dfrac{\sqrt{x}}{\sqrt{x}} = \dfrac{\sqrt{x}}{x^3\cdot x} = \dfrac{\sqrt{x}}{x^4}$

(D)

or $\sqrt{\dfrac{1}{x^7}} = \left(\dfrac{1}{x^7}\right)^{1/2} = \dfrac{1}{x^{7/2}}$

(C) (24) $\sqrt[4]{\sqrt[3]{w}} = w^{1/3\cdot 1/4} = w^{1/12} = \sqrt[12]{w}$

(25) $\dfrac{(x^{1/3})^2}{(x^3)^{7/3}} = \dfrac{x^{2/3}}{x^7} = x^{2/3-7/1} = x^{2/3-21/3} = x^{-19/3}$

$= \dfrac{1}{x^{19/3}}$

(B)

(26) $\sqrt[3]{9x}\cdot\sqrt[3]{4x} = \boxed{\sqrt[3]{36x^2}}$

(D)

(27) $\sqrt[3]{25xy}\cdot\sqrt[3]{9xy} = \boxed{\sqrt[3]{225x^2y^2}}$

(C)

(28) $\sqrt{\dfrac{19}{x^4}} = \dfrac{\sqrt{19}}{x^2}$ (B)

29) $\sqrt[3]{\dfrac{81x^4}{3x}} = \sqrt[3]{27x^3} = \sqrt[3]{3\cdot3\cdot3\cdot x\cdot x\cdot x} = \boxed{3x}$

D

30) $\sqrt{2}\cdot\sqrt{3} = \boxed{\sqrt{6}}$ B

31) $\sqrt[4]{\dfrac{r^2}{256}} = \boxed{\dfrac{\sqrt[4]{r^2}}{4}}$ D

32) $\sqrt{98} = \sqrt{2\cdot7\cdot7} = \boxed{7\sqrt{2}}$ A

$$\begin{array}{r|l} 2 & 256 \\ 2 & 128 \\ 2 & 64 \\ 2 & 32 \\ 2 & 16 \\ 2 & 8 \\ 2 & 4 \\ & 2 \end{array}$$

33) $\sqrt[3]{162} = \sqrt[3]{2\cdot3\cdot3\cdot3\cdot3} = \boxed{3\sqrt[3]{6}}$ C

34) $\sqrt[4]{1536} = 2\cdot2\sqrt[4]{2\cdot3} = \boxed{4\sqrt[4]{6}}$ B

$$\begin{array}{r|l} 2 & 1536 \\ 2 & 768 \\ 2 & 384 \\ 2 & 192 \\ 2 & 96 \\ 2 & 48 \\ 2 & 24 \\ 2 & 12 \\ 2 & 6 \\ & 3 \end{array}$$

35) $-\sqrt{12k^7q^8} = -\sqrt{2\cdot2\cdot3\,k^7q^8}$

$= \boxed{-2k^3q^4\sqrt{3k}}$ B

36) $\sqrt[3]{-64a^8b^5} = \sqrt[3]{(-4)(-4)(-4)\,a^8b^5}$

$= \sqrt[3]{(-4)(-4)(-4)\,a\cdot a\cdot a\;a\cdot a\cdot a\cdot a\cdot a\;b\cdot b\cdot b\cdot b\cdot b}$

$= \boxed{-4a^2b\sqrt[3]{a^2b^2}}$ A

37) $\sqrt[3]{\dfrac{y^{22}}{27}} = \boxed{\dfrac{y^7\cdot\sqrt[3]{y}}{3}}$ D

38 $\sqrt[8]{x^{20}} = x^{20/8} = x^{5/2} = \sqrt{x^5} = \boxed{x^2\sqrt{x}}$

A

39 $\sqrt[3]{3} \cdot \sqrt[4]{2} = 3^{1/3} \cdot 2^{1/4} = 3^{4/12} \cdot 2^{3/12} =$

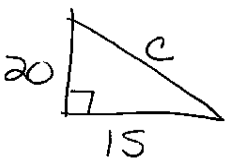
lcd = 12 $= \sqrt[12]{3^4}\ \sqrt[12]{2^3}$

B $= \sqrt[12]{3^4 \cdot 2^3} = \sqrt[12]{81 \cdot 8} = \sqrt[12]{648}$

40 $\sqrt{3} \cdot \sqrt[3]{4} = 3^{1/2} \cdot 4^{1/3} = 3^{3/6} \cdot 4^{2/6}$

lcd = 6

$= \sqrt[6]{3^3} \cdot \sqrt[6]{4^2} = \sqrt[6]{27 \cdot 16} = \sqrt[6]{432}$ C

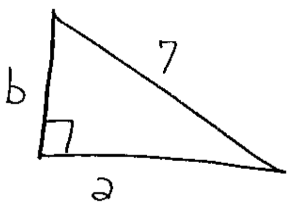
41 

$20^2 + 15^2 = c^2$

$400 + 225 = c^2$

$625 = c^2$

$\sqrt{625} = c = \boxed{25}$ C

42 

$b^2 + 2^2 = 7^2$

$b^2 + 4 = 49$

$b^2 = 45$

$b = \sqrt{45} = \boxed{3\sqrt{5}}$ D

43 $\sqrt[4]{48^2} = 48^{2/4} = 48^{1/2} = \sqrt{48} = \sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3}$

$= \boxed{4\sqrt{3}}$ D

(44) distance formula

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

(5, 6)
(-4, -1)

$2 \,|\, 130$
$5 \,|\, 65$
13

(A) $d = \sqrt{(5 - -4)^2 + (6 - -1)^2}$

$d = \sqrt{9^2 + 7^2}$

$d = \sqrt{81 + 49} = \boxed{\sqrt{130}}$

(45) distance (-1, -2)
(1, -6)

$d = \sqrt{(-1-1)^2 + (-2 - -6)^2}$

(A) $d = \sqrt{(-2)^2 + (-2+6)^2} = \sqrt{4 + (4)^2}$

$d = \sqrt{4 + 16} = \sqrt{20} = \sqrt{4 \cdot 5} = \boxed{2\sqrt{5}}$

(46) $\sqrt{4} - \sqrt{16} = 2 - 4 = \boxed{-2}$ (A)

(47) $8\sqrt{3} + 9\sqrt{3} = (8+9)\sqrt{3} = \boxed{17\sqrt{3}}$ (A)

(48) $\sqrt{2x} + 2\sqrt{32x} + 8\sqrt{72x}$

$= \sqrt{2x} + 2\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2\,x} + 8\sqrt{2 \cdot 36\,x}$

$= \sqrt{2x} + 2 \cdot 2 \cdot 2\sqrt{2x} + 8 \cdot 6\sqrt{2x}$

$= \sqrt{2x} + 8\sqrt{2x} + 48\sqrt{2x} = (1 + 8 + 48)\sqrt{2x}$

$= \boxed{57\sqrt{2x}}$

(B)

(49) $8\sqrt[4]{x^7} - 4x\sqrt[4]{x^3}$

(C) $= 8\cdot x\sqrt[4]{x^3} - 4x\sqrt[4]{x^3} = (8-4)x\sqrt[4]{x^3} = \boxed{4x\sqrt[4]{x^3}}$

(50) $5\sqrt[5]{m^{11}p^7} - 3m^2p\sqrt[5]{mp^2}$

$= \underbrace{5m^2p\sqrt[5]{mp^2}} - \underbrace{3m^2p\sqrt[5]{mp^2}} = \boxed{2m^2p\sqrt[5]{mp^2}}$ (C)

(51) $\dfrac{\sqrt{294}}{5} - \dfrac{5\sqrt{6}}{5} + \dfrac{\sqrt{6}}{\sqrt{25}} = \dfrac{\sqrt{294}}{5} - \dfrac{5\sqrt{6}}{5} + \dfrac{\sqrt{6}}{5}$

$2\,|\,294$
$7\,|\,147$
$7\,|\,21$
3

$\sqrt{294} = 7\sqrt{6}$

$\dfrac{7\sqrt{6}}{5} - \dfrac{5\sqrt{6}}{5} + \dfrac{1\sqrt{6}}{5} = \dfrac{(8-5)\sqrt{6}}{5} = \boxed{\dfrac{3\sqrt{6}}{5}}$ (C)

(52) $(2-5\sqrt{3})^2$

$= (2-5\sqrt{3})(2-5\sqrt{3})$

$= 4 - 10\sqrt{3} - 10\sqrt{3} + 25(3)$

$= 4 - 20\sqrt{3} + 75$

$= \boxed{79 - 20\sqrt{3}}$

(C)

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

$\boxed{\sqrt{10} - 5\sqrt{5} + 7\sqrt{2} - 35}$

(C)

(54) $(9\sqrt{x} + \sqrt{y})(9\sqrt{x} - \sqrt{y})$

$81\sqrt{x^2} - \cancel{9\sqrt{xy}} + \cancel{9\sqrt{xy}} - \sqrt{y^2}$

$\boxed{81x - y}$

(B)

(55) $-\sqrt{\frac{49}{12}} = \frac{-7}{2\sqrt{3}} = \frac{-7}{2\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{-7\sqrt{3}}{2(3)} = \boxed{\frac{-7\sqrt{3}}{6}}$

$12 = 2 \cdot 2 \cdot 3$

(C)

(56) $-\sqrt{\frac{245x^3}{y^5}} = \frac{-7x\sqrt{5x}}{y^2\sqrt{y}}$

$5 \,|\, 245$

$7 \,|\, 49$

7

$= \frac{-7x}{y^2} \cdot \frac{\sqrt{5x}}{\sqrt{y}} \cdot \frac{\sqrt{y}}{\sqrt{y}} = \frac{-7x\sqrt{5xy}}{y^2 \cdot y} = \boxed{\frac{-7x\sqrt{5xy}}{y^3}}$ (D)

(57) $\frac{2}{\sqrt{11}} = \frac{2}{\sqrt{11}} \cdot \frac{\sqrt{11}}{\sqrt{11}} = \frac{2\sqrt{11}}{11}$ (C)

(58) $\sqrt[3]{\frac{7}{3}} = \frac{\sqrt[3]{7}}{\sqrt[3]{3}} = \frac{\sqrt[3]{7}}{\sqrt[3]{3}} \cdot \frac{\sqrt[3]{3 \cdot 3}}{\sqrt[3]{3 \cdot 3}} = \boxed{\frac{\sqrt[3]{63}}{3}}$ (D)

have	need
3	3·3

(59) $\sqrt[3]{\frac{7}{9x^2}} \cdot \frac{\sqrt[3]{3x}}{\sqrt[3]{3x}} = \boxed{\frac{\sqrt[3]{21x}}{3x}}$ (A)

have	need
3·3	3
x x	x

(60) $\frac{4}{8-\sqrt{3}} = \frac{4}{8-\sqrt{3}} \cdot \frac{8+\sqrt{3}}{8+\sqrt{3}} = \frac{32+4\sqrt{3}}{64 \cancel{-8\sqrt{3}} \cancel{+8\sqrt{3}} - \sqrt{9}}$

conjugates

$= \frac{32+4\sqrt{3}}{64-3} = \boxed{\frac{32+4\sqrt{3}}{61}}$ (C)

61 $$\frac{5-\sqrt{2}}{5+\sqrt{2}} = \frac{5-\sqrt{2}}{5+\sqrt{2}} \cdot \frac{5-\sqrt{2}}{5-\sqrt{2}} = \frac{25-5\sqrt{2}-5\sqrt{2}+\sqrt{4}}{25+\cancel{5\sqrt{2}}-\cancel{5\sqrt{2}}-\sqrt{4}}$$

conjugates!

$$= \frac{25-10\sqrt{2}+2}{25-2} = \boxed{\frac{27-10\sqrt{2}}{23}}$$ D

62 $$\frac{35y+\sqrt{1715y^3}}{5y}$$

$$\begin{array}{r|l} 5 & 1715 \\ 7 & 343 \\ 7 & 49 \\ & 7 \end{array}$$

$$= \frac{35y+7y\sqrt{35y}}{5y} = \boxed{\frac{35+7\sqrt{35y}}{5}}$$ A

(cancel one y)

63 $$\frac{28+36\sqrt{14}}{40} = \boxed{\frac{7+9\sqrt{14}}{10}}$$ D

cancel 4 from each

64
$$\sqrt{5q-4}=4$$
$$(\sqrt{5q-4})^2=4^2$$
$$5q-4=16$$
$$5q=20$$
$$\boxed{q=4}$$ ✓

check: $\sqrt{5(4)-4}=4$
$\sqrt{16}=4$
$4=4$

A

65
$$\sqrt{7x-9}-8=0$$
$$\sqrt{7x-9}=8$$
$$7x-9=64$$
$$7x=73$$

$$\boxed{x=\frac{73}{7}}$$ ✓

check:
$\sqrt{7\left(\frac{73}{7}\right)-9}-8=0$
$\sqrt{64}-8=0$
$8-8=0$
$0=0$

D

(66)

$4\sqrt{x} = \sqrt{9x+9}$

$(4\sqrt{x})^2 = (\sqrt{9x+9})^2$

(C)

$16x = 9x+9$

$-9x \quad -9x$

$7x = 9$

$\boxed{x = 9/7}$ ✓

check: $4\sqrt{\frac{9}{7}} = \sqrt{9(\frac{9}{7})+9}$

$4(\sqrt{\frac{9}{7}}) = \sqrt{\frac{81}{7}+9}$

$4.536 = 4.536$

(67)

$\sqrt{p^2-2p+49} = p+3$

$(\sqrt{p^2-2p+49})^2 = (p+3)^2$

$\cancel{p^2}-2p+49 = \cancel{p^2}+6p+9$

(C)

$-8p = 9-49$

$-8p = -40$

$\boxed{p=5}$ ✓

check:

$\sqrt{(5)^2-2(5)+49} =$

$5+3$

$\sqrt{25-10+49} = 8$

$\sqrt{64} = 8$

$8 = 8$

(68)

$\sqrt{x+7} + 5 = x$

$\sqrt{x+7} = x-5$

$(\sqrt{x+7})^2 = (x-5)^2$

(B)

$x+7 = x^2-10x+25$

$0 = x^2-11x+18$

$0 = (x-9)(x-2)$

$\boxed{x=9}$ ✓ $\quad \boxed{\cancel{x=2}}$

check:

$x=9$

$\sqrt{9+7} + 5 = 9$

$\sqrt{16} + 5 = 9$

$4+5 = 9$

$9 = 9$

$x = 2$

$\sqrt{2+7} + 5 = 2$

$\sqrt{9} + 5 = 2$

$3 + 5 = 2$

$8 = 2$

69

$$\sqrt[3]{4+6t} - \sqrt[3]{1-8t} = 0$$

$$\sqrt[3]{4+6t} = \sqrt[3]{1-8t}$$

$$\left(\sqrt[3]{4+6t}\right)^3 = \left(\sqrt[3]{1-8t}\right)^3$$

C

$$4+6t = 1-8t$$

$$6t+8t = 1-4$$

$$14t = -3$$

$$\boxed{t = -3/14}$$

✓

check:

$$\sqrt[3]{4+6\left(\tfrac{-3}{14}\right)} - \sqrt[3]{1-8\left(\tfrac{-3}{14}\right)} = 0$$

$$\sqrt[3]{2.714} - \sqrt[3]{2.714} = 0$$

$$0 = 0$$

70

$$\sqrt{2x+5} - \sqrt{x-2} = 3$$

$$\sqrt{2x+5} = \sqrt{x-2} + 3$$

$$\left(\sqrt{2x+5}\right)^2 = \left(\sqrt{x-2}+3\right)^2$$

A

$$2x+5 = \left(\sqrt{x-2}+3\right)\left(\sqrt{x-2}+3\right)$$

$$2x+5 = x-2+3\sqrt{x-2}+3\sqrt{x-2}+9$$

$$2x+5 = x+7+6\sqrt{x-2}$$

$$2x-x+5-7 = 6\sqrt{x-2}$$

$$x-2 = 6\sqrt{x-2}$$

$$(x-2)^2 = \left(6\sqrt{x-2}\right)^2$$

$$x^2-4x+4 = 36(x-2)$$

$$x^2-4x+4 = 36x-72$$

$$x^2-4x-36x+4+72 = 0$$

$$x^2-40x+76 = 0$$

$$(x-38)(x-2) = 0$$

$$\boxed{x=38} \qquad \boxed{x=2}$$

✓ ✓

$2\overline{)76}$
38

check:

$x = 38$

$$\sqrt{2(38)+5} - \sqrt{38-2} = 3$$

$$\sqrt{81} - \sqrt{36} = 3$$

$$9 - 6 = 3$$

$$3 = 3$$ ✓

$x = 2$

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

$$\sqrt{9} - 0 = 3$$

$$3 = 3$$ ✓

C 71 $\sqrt{-121} = \sqrt{-1}\cdot\sqrt{121} = i\cdot 11 = \boxed{11i}$

72 $\sqrt{3x+1} = 3+\sqrt{x-4}$

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

$3x+1 = (3+\sqrt{x-4})(3+\sqrt{x-4})$

$3x+1 = 9 + 3\sqrt{x-4} + 3\sqrt{x-4} + x-4$

$3x+1 = 5+x+6\sqrt{x-4}$

$3x-x+1-5 = 6\sqrt{x-4}$

$2x-4 = 6\sqrt{x-4}$

(divide all parts by 2)

$x-2 = 3\sqrt{x-4}$

$(x-2)^2 = (3\sqrt{x-4})^2$

A $x^2-4x+4 = 9(x-4)$

$x^2-4x+4 = 9x-36$

$x^2-4x-9x+4+36=0$

$x^2-13x+40=0$

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

$\boxed{x=5}$ ✓ $\boxed{x=8}$ ✓

Check:

$\boxed{x=5}$

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

$\sqrt{16} = 3+\sqrt{1}$

$4 = 3+1$

$4=4$ ✓

$\boxed{x=8}$

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

$\sqrt{25} = 3+\sqrt{4}$

$5 = 3+2$

$5=5$ ✓

73 $\sqrt{-81} = \sqrt{-1}\cdot\sqrt{81} = i\cdot 9 = \boxed{9i}$

D

74 $\sqrt{-234} = \sqrt{-1\cdot 2\,(3\cdot 3)\cdot 13}$

C $= \boxed{3i\sqrt{26}}$

$2\,|\,234$, $3\,|\,117$, $3\,|\,39$, 13

$2\,|\,216$, $2\,|\,108$, $2\,|\,54$, $3\,|\,27$, $3\,|\,9$, 3

75 $-\sqrt{-216} = -1\cdot 2\cdot 3\, i\sqrt{2\cdot 3}$

B $= \boxed{-6i\sqrt{6}}$

76 $\sqrt{-9}\cdot\sqrt{-16} = (3i)(4i) = 12i^2$
$= 12(-1) = \boxed{-12}$

A

77 $\sqrt{\frac{-250}{-25}} = \frac{i\cancel{\sqrt{25}}\sqrt{10}}{i\cancel{\sqrt{25}}} = \boxed{\sqrt{10}}$ D

78 $(4+4i) - (-2+i) = 4+4i+2-i = \boxed{6+3i}$
$=$

B

79 $(1+2i) - (10+2i) + (8+4i)$

B $1+\cancel{2i}-10-\cancel{2i}+8+4i$

$(1-10+8)+4i = \boxed{-1+4i}$

80 $(4-2i)(7+7i)$ FOIL

$28+28i-14i-14i^2$

C $28+14i-14(-1)$

$28+14i+14$

$\boxed{42+14i}$

81 $i(7-4i)(8-3i)$

$= i(56-21i-32i+12i^2)$

$= i(56-53i+12(-1))$

$= i(56-53i-12)$

C $= i(44-53i)$

$= 44i-53i^2$

$= 44i-53(-1)$

$= \boxed{53+44i}$

82 $\frac{3}{1+3i}\cdot\frac{1-3i}{1-3i} = \frac{3-9i}{1+\cancel{3i}-\cancel{3i}-9i^2}$

$= \frac{3-9i}{1-9(-1)} = \frac{3-9i}{1+9} = \frac{3-9i}{10} = \boxed{\frac{3}{10}-\frac{9}{10}i}$ A

83 $\frac{4+3i}{5+2i}\cdot\frac{5-2i}{5-2i} = \frac{20-8i+15i-6i^2}{25-\cancel{10i}+\cancel{10i}-4i^2} = \frac{20+7i-6(-1)}{25-4(-1)}$

$= \frac{20+7i+6}{25+4} = \frac{26+7i}{29} = \boxed{\frac{26}{29}+\frac{7}{29}i}$ C

84 $i^{16} = (i^2)^8 = (-1)^8 = \boxed{1}$ D

85 $i^{13} = (i^2)^6 i = (-1)^6 i = \boxed{i}$ A