レベル３

1. 次の計算をしなさい。

(1) $ab(4a-3b)+5a(a-ab-b^2)=-a^2b-8ab^2+5a^2$

(2) $(2x^2+4xy-2yx^3)\div 2x=-x^2y+x+2y$

(3) $(x+y)(x-2y)-(x+2y)(x-y-1)=-2xy+x+2y$

(4) $(p+q+1)(p+1)-(p+1)^2=pq+q$

(5) $\{x-(y+1)\}(x+2)-2(x-y)(y+1)=x^2-3xy+2y^2-x-2$

(6) $3\sqrt{3}-\sqrt{12}=\sqrt{3}$

(7) $(\sqrt{2}+\sqrt{3})(\sqrt{3}-\sqrt{6})=3-3\sqrt{2}-2\sqrt{3}+\sqrt{6}$

(8) $\dfrac{2\sqrt{3}}{2\sqrt{2}}+\dfrac{1}{\sqrt{3}}=\dfrac{2\sqrt{3}+3\sqrt{6}}{6}$

(9) $\dfrac{\sqrt{3}}{2\sqrt{2}+\sqrt{3}}\times\dfrac{1+\sqrt{2}}{\sqrt{2}}=\dfrac{-6-3\sqrt{2}+4\sqrt{3}+4\sqrt{6}}{10}$

(10) $\dfrac{\sqrt{3}}{2\sqrt{2}+\sqrt{3}}\div\dfrac{\sqrt{2}}{1+\sqrt{2}}\times\dfrac{\sqrt{3}+\sqrt{2}}{3}=\dfrac{6+6\sqrt{2}+2\sqrt{3}+\sqrt{6}}{30}$

2. 次の計算をしなさい。

(1) $(4a-3)ab^2-a(ab-b^2)-2a^2b(b-1)=2a^2b^2+a^2b-2ab^2$

(2) $(3x^2y+4x^2y^3)\div x^2y=4y^2+3$

(3) $(x+y)^2-x(x-y-1)-y(2x+1)=xy+y^2+x-y$

(4) $(p+q+1)(p-q)-(p+q)(p-q+1)=-2q$

(5) $(2x-y)(x+2)-2x\{(x-1)^2-(x+1)^2\}=10x^2-yx+4x-2y$

(6) $\sqrt{2}-3\sqrt{3}-\sqrt{8}=-\sqrt{2}-3\sqrt{3}$

(7) $\sqrt{3}(\sqrt{6}-2\sqrt{2})-\sqrt{2}(\sqrt{3}-\sqrt{6})=3\sqrt{2}+2\sqrt{3}-3\sqrt{6}$

(8) $\dfrac{2\sqrt{2}}{2\sqrt{3}}+\dfrac{3}{\sqrt{2}}\div\sqrt{3}=\dfrac{5}{6}\sqrt{6}$

(9) $\dfrac{\sqrt{3}}{2\sqrt{2}}\times\dfrac{1+\sqrt{2}}{\sqrt{2}-\sqrt{3}}=-\dfrac{6+3\sqrt{2}+2\sqrt{3}+2\sqrt{6}}{4}$

(10) $\dfrac{-\sqrt{3}}{3\sqrt{2}-\sqrt{8}}\div\dfrac{\sqrt{12}}{\sqrt{2}+\sqrt{3}}\div\dfrac{\sqrt{3}-\sqrt{2}}{1-\sqrt{3}}=3-\sqrt{3}+\dfrac{-5\sqrt{2}+5\sqrt{6}}{4}$

3. 次の計算をしなさい。

(1) $x^2(4y-3)+5(x^2-yx-yx^2)=-x^2y+2x^2-5xy$

(2) $(x^2y-5x^2y+42y^2x^2)\div yx=42xy-4x$

(3) $(x+y)^2-(x-y)^2=4xy$

(4) $(a+b+c)(a+b)-(a+c)b+(a-b)c=a^2+ab+2ca+b^2-bc$

(5) $p(q-1)(p+2)-\{2(p-q)^2-(p+1)\}=p^2q-3p^2+6pq-2q^2-p+1$

(6) $\sqrt{3}-(\sqrt{2}-2\sqrt{12}-\sqrt{18})=2\sqrt{2}+5\sqrt{3}$

(7) $(\sqrt{2}+1)^2(\sqrt{3}-\sqrt{2})=-4-3\sqrt{2}+3\sqrt{3}+2\sqrt{6}$

(8) $\dfrac{\sqrt{5}}{\sqrt{2}}-\dfrac{\sqrt{2}}{\sqrt{3}}=\dfrac{-2\sqrt{6}+3\sqrt{10}}{6}$

(9) $\dfrac{\sqrt{2}}{\sqrt{2}-2\sqrt{3}}\times\dfrac{-\sqrt{2}}{\sqrt{3}}\times\dfrac{\sqrt{2}-2\sqrt{3}}{\sqrt{6}}=-\dfrac{\sqrt{2}}{3}$

(10) $\dfrac{\sqrt{2}-1}{\sqrt{5}+\sqrt{2}}\div\dfrac{\sqrt{3}}{\sqrt{2}-1}\div\dfrac{\sqrt{3}}{\sqrt{5}-\sqrt{2}}=\dfrac{21-14\sqrt{2}+8\sqrt{5}-6\sqrt{10}}{9}$

4. 次の計算をしなさい。

(1) $(a^2-ab+b^2)-a(a+b)+b(a-b)=-ab$

(2) $(6x^2+12x^4y^3-3yx^3)\div 3x^2=4x^2y^3-xy+2$

(3) $(x-y+1)^2=x^2-2xy+2x+y^2-2y+1$

(4) $p(p+2q)-2q(q-2p)+2(p+q)^2=3p^2+10pq$

(5) $2\{x-2(y+x)\}(x+y)-2(x-y)(y+x)=-4x^2-6xy-2y^2$

(6) $\sqrt{24}-\sqrt{54}=-\sqrt{6}$

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

(8) $2\sqrt{3}\div 3\sqrt{2}+3\dfrac{\sqrt{6}}{\sqrt{3}}=3\sqrt{2}+\dfrac{\sqrt{6}}{3}$

(9) $\sqrt{3}+2\div\sqrt{3}-\sqrt{3}\times\dfrac{1+\sqrt{2}}{\sqrt{2}}=\dfrac{4\sqrt{3}-3\sqrt{6}}{6}$

(10) $\dfrac{\sqrt{3}+1}{\sqrt{2}}\times\dfrac{\sqrt{2}}{1+\sqrt{2}}\div\dfrac{3+\sqrt{3}}{\sqrt{3}}=-1+\sqrt{2}$

5. 次の計算をしなさい。

(1) $(ab-3b^2)a+b(2a^2-3ab+b^2)=3a^2b-6ab^2+b^3$

(2) $(x^2y^2+4xy^3+2y^3-2y^2x^3)\div y^2=-2x^3+x^2+4xy+2y$

(3) $-(x-y)(x+2y)+x(x-y)-(x-2y)^2=-x^2+2xy-2y^2$

(4) $(2p+q+2)(-p+2)-(q-p)(p+1)=-p^2-2pq+3p+q+4$

(5) $\{x-(y-z)\}(x+z)-2(x+3y)(2y-z)=x^2-5xy+4zx-12y^2+5yz+z^2$

(6) $-2\sqrt{12}-2\sqrt{2}(\sqrt{3}-\sqrt{6})=-2\sqrt{6}$

(7) $\sqrt{3}(\sqrt{2}-\sqrt{3})(\sqrt{6}-\sqrt{3})=6-3\sqrt{2}+3\sqrt{3}-3\sqrt{6}$

(8) $\dfrac{-3\sqrt{2}}{2\sqrt{5}}+\dfrac{\sqrt{2}}{\sqrt{15}}=\dfrac{-9\sqrt{10}+2\sqrt{30}}{30}$

(9) $\dfrac{\sqrt{3}-\sqrt{2}}{\sqrt{2}-\sqrt{3}}\div\dfrac{1-\sqrt{3}}{\sqrt{3}}=\dfrac{3+\sqrt{3}}{2}$

(10) $\dfrac{\sqrt{2}+1}{2\sqrt{3}}\div(\sqrt{2}+2)\times\dfrac{2\sqrt{3}+1}{\sqrt{2}}=\dfrac{6+\sqrt{3}}{12}$

6. 次の計算をしなさい。

(1) $(4a^2-3ab+2b^2)+a(a-b)-3b(a+b)=5a^2-7ab-b^2$

(2) $(x+2y)(xy-2yx^2)\div xy=-2x^2-4xy+x+2y$

(3) $(x-y)^2+(x+y)^2-(x+2y)(x-2y)=x^2+6y^2$

(4) $(p+2)(p+1)^2=p^3+4p^2+5p+2$

(5) $\{x-(y-1)\}\{x+2(y-1)\}=x^2+xy-2y^2-x+4y-2$

(6) $\sqrt{2}(\sqrt{3}-\sqrt{2}-1)-\sqrt{24}=-2-\sqrt{2}-\sqrt{6}$

(7) $(\sqrt{2}+\sqrt{3})^2-(\sqrt{2}-\sqrt{3})^2=4\sqrt{6}$

(8) $\dfrac{3}{\sqrt{2}\times\sqrt{3}}+\dfrac{\sqrt{3}-1}{\sqrt{3}}=1+\dfrac{-2\sqrt{3}+3\sqrt{6}}{6}$

(9) $\dfrac{\sqrt{5}+\sqrt{3}}{\sqrt{2}+\sqrt{3}}-\dfrac{\sqrt{5}+\sqrt{2}}{\sqrt{3}}=3-\sqrt{10}+\dfrac{-4\sqrt{6}+2\sqrt{15}}{3}$

(10) $\dfrac{2\sqrt{3}+\sqrt{2}}{\sqrt{3}-1}\times\dfrac{2}{1+\sqrt{3}}-\dfrac{3+\sqrt{3}}{\sqrt{2}}\div\dfrac{2}{\sqrt{3}+\sqrt{2}}=\dfrac{-6+\sqrt{2}+6\sqrt{3}-3\sqrt{6}}{4}$

7. 次の計算をしなさい。

(1) $(a^2-a-b-b^2)+(a-b+1)a+b(b+a+1)=2a^2$

(2) $2xy\dfrac{x+y-1}{3}\div(2y\div 3x^2)=x^4+x^3y-x^3$

(3) $(2x+y)(2x-y)-(2x+y)^2=-4xy-2y^2$

(4) $(p+q+r)(p-r)-(p+r)(p-r)=pq-qr$

(5) $(x-y)(x+2y)(2x+y)-2(x^2-y^2)(x+y)=x^2y-xy^2$

(6) $\sqrt{6}-(\sqrt{12}-\sqrt{18})\sqrt{3}=-6+4\sqrt{6}$

(7) $(1+\sqrt{2}+\sqrt{3})(\sqrt{3}-1)=2-\sqrt{2}+\sqrt{6}$

(8) $\dfrac{-1}{2\sqrt{2}+2\sqrt{3}}+\dfrac{\sqrt{2}}{\sqrt{2}+\sqrt{3}}=-2+\sqrt{6}+\dfrac{\sqrt{2}-\sqrt{3}}{2}$

(9) $-\dfrac{\sqrt{2}-1}{1-\sqrt{3}}\div\dfrac{1+\sqrt{2}}{3+2\sqrt{2}}=\dfrac{1+\sqrt{3}}{2}$

(10) $\dfrac{2-\sqrt{3}}{2+\sqrt{3}}+\dfrac{2+\sqrt{3}}{1+\sqrt{3}}\times\dfrac{1+3\sqrt{3}}{\sqrt{3}}=9-\dfrac{7\sqrt{3}}{3}$

8. 次の計算をしなさい。

(1) $(4ab-3b^2)+ab(a-1-b^2)-b\{b-(ab^2-a)\}=a^2b+2ab-4b^2$

(2) $xy\dfrac{x^2+yx}{3x}\times 3(y^2\div xy^2)=xy+y^2$

(3) $-(x-y)^2-(y-z)^2+(z-x)^2=2xy-2zx-2y^2+2yz$

(4) $p(p+1)(p-1)-(p+1)p^2=-p^2-p$

(5) $(x+2)^2-2\{(x(x-1)-2(x+1)\}=-x^2+10x+8$

(6) $\sqrt{2}-\sqrt{3}(\sqrt{12}-\sqrt{6})=-6+4\sqrt{2}$

(7) $\sqrt{3}(\sqrt{3}-\sqrt{6})-(\sqrt{2}+1)^2=-5\sqrt{2}$

(8) $2(\sqrt{2}+1)\times\dfrac{\sqrt{2}}{\sqrt{3}}\times\dfrac{\sqrt{2}+1}{2}\dfrac{4}{3}\sqrt{3}+\sqrt{6}$

(9) $\dfrac{1-\sqrt{3}}{2+\sqrt{3}}+\dfrac{1+\sqrt{2}}{\sqrt{2}}-\dfrac{\sqrt{3}}{1-\sqrt{2}}=6+\dfrac{\sqrt{2}}{2}-2\sqrt{3}+\sqrt{6}$

(10) $\dfrac{1}{\sqrt{2}-1}\div\dfrac{\sqrt{2}-1}{1+\sqrt{2}}\times\dfrac{3+2\sqrt{2}}{\sqrt{3}}=\dfrac{41\sqrt{3}+29\sqrt{6}}{3}$

9. 次の計算をしなさい。

(1) $-b^2(a-3b)+5a(ab-b^2)+b(b^2-ab+a^2)-(b^2a-ba^2)=7a^2b-8ab^2+4b^3$

(2) $(2x+3y+1)\div(2xy\div 3yx^2)\times 2xy^3=6x^3y^3+9x^2y^4+3x^2y^3$

(3) $(2x+y)(3x-y)-(x+2y)(x-y)=5x^2+y^2$

(4) $(q+1)(pq+1)-(p+1)(q^2+p)+(p+q)(1-2p)=-3p^2-pq-q^2+2q+1$

(5) $\{x^2-2(x+1)+2x\}^2-2(x^2-1)(x^2+1)=-x^4-4x^2+6$

(6) $\sqrt{2}(1+\sqrt{2}-\sqrt{3})-\sqrt{3}(2+\sqrt{2}-\sqrt{3})=5+\sqrt{2}-2\sqrt{3}-2\sqrt{6}$

(7) $(1+\sqrt{3})(2-\sqrt{2})+(\sqrt{3}+\sqrt{2})(\sqrt{2}-2\sqrt{3})=-2-\sqrt{2}+2\sqrt{3}-2\sqrt{6}$

(8) $\dfrac{2}{\sqrt{2}+1}\times\dfrac{2\sqrt{3}}{2\sqrt{2}}\div\dfrac{\sqrt{3}}{\sqrt{3}+1}=2-\sqrt{2}+2\sqrt{3}-\sqrt{6}$

(9) $(2\sqrt{2}+1)\times\dfrac{\sqrt{3}}{\sqrt{2}+1}\times\dfrac{1+2\sqrt{2}}{\sqrt{2}+2}=-6\sqrt{3}+\dfrac{11}{2}\sqrt{6}$

(10) $3\dfrac{\sqrt{2}}{2\sqrt{6}+1}\div\dfrac{\sqrt{2}+\sqrt{3}}{1+\sqrt{3}}\div\dfrac{\sqrt{3}-\sqrt{2}}{2}=\dfrac{72-6\sqrt{2}+24\sqrt{3}-6\sqrt{6}}{23}$

10. 次の計算をしなさい。

(1) $ac(-c-b)+3a(ab-bc-b^2)-cb(b-c+a)+2c^2(b-a)=3a^2b-3ab^2-3c^2a-5abc-b^2c+3bc^2$

(2) $\dfrac{z^3(x^2+2xz-z^2)}{3y}\times 6\dfrac{x^2y^2-xy^2z}{z^3}\div\dfrac{2xy}{5z^2}=5x^3z^2+5x^2z^3-15xz^4+5z^5$

(3) $(x+y+1)(x-y-1)-(x+y+1)(1-x-y)=2x^2+2xy-2y-2$

(4) $(2p-q)(p-q+1)-2(p-q)(q+1)p-(q-2)(q-p)-pq(2q-3p)=p^2q+q$

(5) $\{2x-(2y+1)\}(x+1)-2(x-y)\{y-2(x+1)\}=6x^2-8xy+2y^2+5x-6y-1$

(6) $\sqrt{3}(\sqrt{3}-\sqrt{12})=-3$

(7) $(1-\sqrt{3})(2\sqrt{3}-\sqrt{5})=-6+2\sqrt{3}-\sqrt{5}+\sqrt{15}$

(8) $\dfrac{1}{2\sqrt{2}}+\dfrac{1}{\sqrt{3}}+\dfrac{\sqrt{2}+\sqrt{3}}{\sqrt{6}}=\dfrac{9\sqrt{2}+8\sqrt{3}}{12}$

(9) $\dfrac{-\sqrt{3}}{\sqrt{2}+3}\times\dfrac{1+\sqrt{3}}{\sqrt{2}}\times\dfrac{\sqrt{3}+1}{\sqrt{2}-1}=-\dfrac{12+3\sqrt{2}+8\sqrt{3}+2\sqrt{6}}{7}$

(10) $2\sqrt{2}(3+\sqrt{6})\times\dfrac{\sqrt{3}}{\sqrt{3}+\sqrt{2}}\div\dfrac{\sqrt{3}+\sqrt{2}}{3}=-36+18\sqrt{6}$