Maths 4th ESO

EXAM 1_2 (Polynomials- Surds)

1. Work out and simplify:

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

b)(0.75 p) $(x^2-2)(x^3-x^2+2x-1) =$

c) (0.75 p) $2x^3y^2(x^2y^2-3xy) - 2x^2(x^2y^3+2) =$

2. Rationalise and simplify:

a) (0.75 p) $\dfrac{\sqrt{2}}{3-\sqrt{2}}$

b) (0.75 p) $\dfrac{2a}{\sqrt[3]{a^2}}$

c) (0.75 p) $\dfrac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}}$

3. Work out and simplify:

a)(0.75 p) $\sqrt{\sqrt{2500}} =$

b) (0.75 p) $\sqrt{2}.\sqrt{8}.\sqrt[3]{16} =$

c) (0.75p) $7\sqrt{\dfrac{2}{3}} - 3\sqrt{\dfrac{50}{12}} + \sqrt{\dfrac{2}{27}} - \dfrac{1}{5}\sqrt{\dfrac{8}{3}} =$

4. Factorise:

a)(0.5 p) $16x^4 - 8x^3 + x^2$

b) (1.25 p) $5x^3 - 20x^2 - 20x + 80$

cc) (1.25 p) $x^4 - 5x^2 + 4$

SOLUTION

1. Work out and simplify:

a) $x(x+2)^2 - x^2(x+4) - 2(x+2)(x-2) = x(x^2+4x+4) - x^3 - 4x^2 -$

$-2(x^2-4) = x^3+4x^2+4x-x^3-4x^2-2x^2+8 = -2x^2+4x+8$

b) $(x^2-2)(x^3-x^2+2x-1) = x^5-x^4+2x^3-x^2-2x^3+2x^2-4x+2 =$

$= x^5-x^4+x^2-4x+2$

c) $2x^3y^2(x^2y^2-3xy) - 2x^2(x^2y^3+2) = 2x^5y^4-6x^4y^3-2x^4y^3-4x^2 =$

$= 2x^5y^4 - `8x^4y^3 - 4x^2$

2. Rationalise and simplify:

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

b) $\dfrac{2a}{\sqrt[3]{a^2}} = \dfrac{2a\sqrt[3]{a}}{\sqrt[3]{a^2}\sqrt[3]{a}} = \dfrac{2a\sqrt[3]{a}}{a} = 2\sqrt[3]{a}$

c) $\dfrac{\sqrt{5}+\sqrt{2}}{\sqrt{5}-\sqrt{2}} = \dfrac{(\sqrt{5}+\sqrt{2})(\sqrt{5}+\sqrt{2})}{(\sqrt{5}-\sqrt{2})(\sqrt{5}+\sqrt{2})} = \dfrac{5+2\sqrt{5}\sqrt{2}+2}{5-2} = \dfrac{7+2\sqrt{10}}{3}$

3. Work out and simplify:

a) $\sqrt{\sqrt{2500}} = \sqrt[4]{2^2\cdot 5^4} = 5\sqrt[4]{2^2} = 5\sqrt{2}$

b) $\sqrt{2}.\sqrt{8}.\sqrt[3]{16} = \sqrt[6]{2^3}\sqrt[6]{(2^3)^3}\sqrt[6]{(2^4)^2} = \sqrt[6]{2^3\cdot 2^9\cdot 2^8} = \sqrt[6]{2^{20}} = \sqrt[3]{2^{10}} = 8\sqrt[3]{2}$

c) $7\sqrt{\dfrac{2}{3}} - 3\sqrt{\dfrac{50}{12}} + \sqrt{\dfrac{2}{27}} - \dfrac{1}{5}\sqrt{\dfrac{8}{3}} = 7\sqrt{\dfrac{2}{3}} - \dfrac{3\cdot 5}{2}\sqrt{\dfrac{2}{3}} + \dfrac{1}{3}\sqrt{\dfrac{2}{3}} - \dfrac{2}{5}\sqrt{\dfrac{2}{3}} =$

$= \left(7 - \dfrac{15}{2} + \dfrac{1}{3} - \dfrac{2}{5}\right)\sqrt{\dfrac{2}{3}} = \left(\dfrac{210-225+10-12}{30}\right)\sqrt{\dfrac{2}{3}} = -\dfrac{17}{30}\sqrt{\dfrac{2}{3}}$

4. Factorise:

a) $16x^4 - 8x^3 + x^2 = x^2(16x^2 - 8x + 1) = x^2(4x-1)^2$

b) $5x^3 - 20x^2 - 20x + 80 = 5(x^3 - 4x^2 - 4x + 16)$

$Div(16) = \pm 1, \pm 2, \pm 4, \pm 8, \pm 16$

$P(1) = 1 - 4 - 4 + 16 \neq 0$ $\qquad$ $P(-1) = -1 - 4 + 4 + 16 \neq 0$

$P(2) = 8 - 16 - 8 + 16 = 0$

	1	-4	-4	+16
2		2	-4	-16
	1	-2	-8	0

$x^2 - 2x - 8 = 0$

$x = \dfrac{2 \pm \sqrt{4+32}}{2} = \begin{cases} 4 \\ -2 \end{cases}$

$5x^3 - 20x^2 - 20x + 80 = 5(x-2)(x+2)(x-4)$

c) $x^4 - 5x^2 + 4$ $\qquad$ $Div(4) = \pm 1, \pm 2, \pm 4$

$P(1) = 1 - 5 + 4 = 0$ $\qquad$ $P(-1) = 1 - 5 + 4 = 0$

	1	0	-5	0	+4
1		1	1	-4	-4
	1	1	-4	-4	0
-1		-1	0	+4	
	1	0	-4	0	

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

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