Simplify the following Rational Expressions – Multiplication and Division

1. $\dfrac{-8x^2}{y^3} \cdot \dfrac{15y}{4x} = \dfrac{-2 \cdot 3 \cdot 5 \cdot x}{y^2}$

2. $\dfrac{2rs}{3} \cdot \dfrac{-3}{4s} = \dfrac{-r}{2}$

3. $\dfrac{24m^6n}{18m^3} \cdot \left(\dfrac{9n^4}{2m}\right)^{-1} = \dfrac{24m^6n}{18m^3} \cdot \dfrac{2m}{9n^4} = \dfrac{2^3 \cdot 3m^6n \cdot 2m}{3^2 \cdot 2m^3 \cdot 3^2 n^4} = \dfrac{2^4 \cdot 3m^7n}{3^4 \cdot 2m^3n^4} = \dfrac{2^3 m^4}{3^3 n^3}$

4. $(2a^2)(3b)^{-1}(15b^3)(2a)^{-2} = \dfrac{2a^2}{3b} \cdot \dfrac{3 \cdot 5b^3}{2^2 a^2} = \dfrac{5b^2}{2}$

5. $(9xy^3)(3ay)^{-1}(8a^4x)(2y)^{-2} = \dfrac{3^2 xy^3}{3ay} \cdot \dfrac{2^3 a^4 x}{2^2 y^2} = \dfrac{2^3 3^2 a^4 x^2 y^3}{2^2 3ay^3} = 2 \cdot 3a^3 x^2$

6. $\dfrac{x^2 + 3x}{x^2 + 2x - 3} \cdot \dfrac{x+1}{x} = \dfrac{x(x+3)(x+1)}{(x+3)(x-1)x} = \dfrac{(x+1)}{(x-1)}$

7. $\dfrac{x^2 - 9}{4x + 12} \cdot \dfrac{6}{x-3} = \dfrac{(x+3)(x-3) \cdot 2 \cdot 3}{4(x+3)(x-3)} = \dfrac{3}{2}$

8. $\dfrac{y^2 + 6y - 16}{y^2 - 64} \cdot (y-2)^{-1} = \dfrac{y^2 + 6y - 16}{y^2 - 64} \cdot \dfrac{1}{(y-2)} = \dfrac{(y+8)(y-2)}{(y+8)(y-8)(y-2)} = \dfrac{1}{(y-8)}$

9. $\dfrac{2y^2 - 50}{2y - 10} \cdot (4y-2) \cdot (6y+30)^{-1} = \dfrac{2y^2 - 50}{2y-10} \cdot \dfrac{(4y-2)}{(6y+30)} = \dfrac{2(y+5)(y-5) \cdot 2(2y-1)}{2(y-5) \cdot 6(y+5)} = \dfrac{(2y-1)}{3}$

10. $\dfrac{2z - 14}{z^2 - 2z - 35} \div \dfrac{6z^3}{z^2 - 25} = \dfrac{2z - 14}{z^2 - 2z - 35} \cdot \dfrac{z^2 - 25}{6z^3} = \dfrac{2(z-7)(z+5)(z-5)}{(z-7)(z+5)6z^3} = \dfrac{(z-5)}{3z^3}$

11. $\dfrac{a^2 - 4a}{a^2 + 2a} \left(\dfrac{a^2 - 9a + 20}{a^2 - 3a - 10}\right)^{-1} = \dfrac{a^2 - 4a}{a^2 + 2a} \cdot \dfrac{a^2 - 3a - 10}{a^2 - 9a + 20} = \dfrac{a(a-4)(a-5)(a+2)}{a(a+2)(a-5)(a-4)} = 1$

12. $\dfrac{2z - 8}{z^2 - 4} \div \dfrac{z - 4}{z^2 + 6z + 8} = \dfrac{2z - 8}{z^2 - 4} \cdot \dfrac{z^2 + 6z + 8}{z - 4} = \dfrac{2(z-4)(z+4)(z+2)}{(z+2)(z-2)(z-4)} = \dfrac{2(z+4)}{(z-2)}$

13. $\dfrac{1+3b-18b^2}{6b^2-17b-3}\left(\dfrac{3b-1}{b-3}\right)^{-1} = \dfrac{1+3b-18b^2}{6b^2-17b-3}\cdot\dfrac{b-3}{3b-1} = \dfrac{-1(6b+1)(3b-1)(b-3)}{(6b+1)(b-3)(3b-1)} = -1$

14. $\dfrac{3a+6c}{9a}\cdot\dfrac{12ac}{a^2-4c^2}\div\dfrac{18a^3c^3}{2a-4c} = \dfrac{3a+6c}{9a}\cdot\dfrac{12ac}{a^2-4c^2}\cdot\dfrac{2a-4c}{18a^3c^3} =$

$\dfrac{3(a+2c)\cdot 12ac\cdot 2(a-2c)}{9a\cdot(a+2c)(a-2c)\cdot 18a^3c^3} = \dfrac{4}{9a^2c^2}$

15. $\dfrac{5c^2-5c}{4a^3}\cdot\dfrac{c^2-9c-10}{4c-40}\div\dfrac{2-2c^2}{a} = \dfrac{5c^2-5c}{4a^3}\cdot\dfrac{c^2-9c-10}{4c-40}\cdot\dfrac{a}{2-2c^2} =$

$\dfrac{5c(c-1)(c-10)(c+1)a}{4a^3\cdot 4(c-10)\cdot -2(c+1)(c-1)} = -\dfrac{5c}{32a^2}$

16. $\dfrac{12a^2-3}{15}\cdot(2a+1)^{-1}\cdot\dfrac{5}{2a+1} = \dfrac{12a^2-3}{15}\cdot\dfrac{1}{(2a+1)}\cdot\dfrac{5}{2a+1} = \dfrac{3(2a-1)(2a+1)\cdot 5}{3\cdot 5\cdot(2a+1)(2a+1)} = \dfrac{(2a-1)}{(2a+1)}$

17. $\dfrac{15-13x+2x^2}{4x^2-9}\cdot\dfrac{2x+1}{1-2x}\cdot\left(\dfrac{5-x}{2x-1}\right)^{-1} = \dfrac{15-13x+2x^2}{4x^2-9}\cdot\dfrac{2x+1}{1-2x}\cdot\dfrac{2x-1}{5-x} =$

$\dfrac{(2x-3)(x-5)(2x+1)(2x-1)}{(2x+3)(2x-3)\cdot -1(2x-1)\cdot -1(x-5)} = \dfrac{(2x+1)}{(2x=3)}$

18. $\dfrac{30-11p+p^2}{9p-6p^2+p^3}\cdot\dfrac{p^2-3p}{25-p^2}\cdot\left(\dfrac{p^2-9}{p^2+2p-15}\right)^{-1} = \dfrac{30-11p+p^2}{9p-6p^2+p^3}\cdot\dfrac{p^2-3p}{25-p^2}\cdot\dfrac{p^2+2p-15}{p^2-9} =$

$\dfrac{(p-5)(p-6)\cdot p(p-3)\cdot(p+5)(p-3)}{p(p-3)(p-3)\cdot -1(p-5)(p+5)(p+3)(p-3)} = -\dfrac{(p-6)}{(p-3)(p+3)}$