MTH-4110 Operations on Algebraic Fractions: **Worksheet #1** (the only one!)

Reduce the following algebraic expressions to lowest terms, making sure to observe the order of operations. Show all the steps in the solutions.

1. $\left(\frac{2c+1}{c+3} + \frac{c^2-c}{c^2+2c-3}\right) \div \frac{3c^2+c}{c^2+c-6}$

2. $\left(\frac{k}{k-1} - \frac{k}{k+1}\right) \div \frac{k}{k^2-1}$

3. $\dfrac{h^2+2h+1}{h^2+3h+2} + \dfrac{(h+3)^2}{h^2-9} \times \dfrac{h+1}{h^2+5h+6}$

4. $\dfrac{x^2+x-2}{x^2-9} \times \dfrac{x+3}{x+2} + \dfrac{1}{x}$

5. $\dfrac{-t^2}{t^2(t^2+t-2)} \div \dfrac{t}{t+2} - \dfrac{2}{t-t^2}$

6. $\left(\frac{x^2+2x-3}{x^2-9} + \frac{x}{x-3}\right) \div (2x-1)$

7. $\left(\frac{2}{a} - \frac{b}{a^2}\right) \div \frac{b}{a^3}$

8. $\left(\frac{m-n}{n} \circ \frac{m}{n}\right) + \frac{m(m+n)}{n^2}$

9. $\frac{a-b}{x-y} \circ \frac{y-x}{b-a} + \frac{1}{a+b}$

11. $\left(\frac{a^2+5a+6}{a+3} - 1 - \frac{a+b}{a}\right) \div \frac{a^3-ab}{a}$

12. $\dfrac{10-10y}{y^2-6y+5} + \dfrac{4y^2+4y+1}{2y^2-y-1} \div \dfrac{2y^2-9y-5}{y^2+4y-5}$

13. $\dfrac{pq+2q-8p-16}{(q-8)^2} \div \dfrac{q+9}{q^2+q-72} - \dfrac{3}{p}$

14. $\dfrac{2x^2-7x+3}{x^2+x-12} + \dfrac{2x^2-5x+3}{-2x^2-2x+4} \circ \dfrac{4x^2-4}{2x^2-x-3}$

15. $\dfrac{a^3-ab^2}{(a-b)^2(a+2b)} \div \left(\dfrac{a+b}{a^2+ab-2b^2} - \dfrac{a+b}{a^2-2ab+b^2}\right)$

16. $\dfrac{2s+3}{s^2-s-2} \times \dfrac{t^2-16}{2st-8s+3t-12} - \dfrac{t+4}{s-2}$

17. $\dfrac{x^2}{x^2 - y^2} - \dfrac{y^2}{x + y} \times \dfrac{2x^2 + xy - y^2}{2xy^2 - y^3}$

18. $\left(\frac{x}{x+2} + 3 - \frac{1}{x}\right) \times \frac{x+2}{8x^2+10x-4}$

19. $\left(\frac{x^2-x-6}{x^2-4} \div \frac{x}{x-2}\right) \div (2x-3)$

20. $\left(a - \frac{8}{a+2} + \frac{a^2-1}{a^2+a-2}\right) \cdot \frac{3a+6}{7-3a-a^2}$

21. $\left(\frac{y}{2y^2-5y-3} - \frac{4}{y^2+2y-15}\right) \circ \frac{2y^2+9y+4}{y^2+5y+4}$

22. $\left(\frac{2x+1}{x+3} + \frac{x}{x+3}\right) \div \frac{3x^2+x}{x^2+x-6}$

23. $\dfrac{m^2 - p^2}{p^2} \div \left(\dfrac{m}{p^2} - \dfrac{2}{p} + \dfrac{1}{m} \right)$

24. $\dfrac{2b^2+9b+4}{b^2+5b+4} + \dfrac{2b(b+2)(b-1)}{2-b-b^2} \times \dfrac{b}{b^2-1}$

25. $\dfrac{m^2+n^2}{m^2-n^2} - \dfrac{n^2}{m+2n} \circ \dfrac{15m^2+27mn-6n^2}{15mn^2-3n^3}$

26. $\dfrac{x^2-3x+2}{x^2-16} - \dfrac{x^2+5x+4}{x^2-2x-3} \circ \dfrac{2x^2-5x-3}{2x^2-32}$

27. $\left(\frac{g}{g-1} - \frac{g}{g+1}\right) \div \frac{g}{g^2-1}$

28. $\dfrac{-2x^2+5x-2}{2x^2-3x+1} + \dfrac{x^2+x-12}{x^2+3x-4} \div \dfrac{x^2-5x+6}{2x^2-7x+6}$

29. $\left(\frac{2g(2g-3k)}{2g^2+gk-6k^2} - 2 + \frac{3k}{g+2k}\right) \times \frac{2g+4k}{gk}$

30. $\left(\frac{f^2+4f}{f^2} - 1 - \frac{f^2}{f^2+4f}\right) \times \frac{f+4}{f^2-4f-16}$

31. $\dfrac{10-10y}{5-6y+y^2} + \dfrac{4y+1+4y^2}{2y^2-y-1} \div \dfrac{2y^2-9y-5}{y^2+4y-5}$

32. $\dfrac{4a^2 - b^2}{b - a} \div \left(\dfrac{2a}{b + a} + \dfrac{3b}{b - a} \right)$

33. $\dfrac{a^3 - ab^2}{(a-b)^2(a+2b)} \div \left(\dfrac{a+b}{a^2+ab-2b^2} - \dfrac{a+b}{a^2-2ab+b^2} \right)$

34. $\dfrac{(2x+2y)(x^2y)}{(2xy+2y^2)(x^2-xy)} - \dfrac{9y^2-x^2}{x^3-3x^2y} \div \dfrac{3y^2-2xy-x^2}{x^2y}$

35. $(s+t) + \dfrac{15s^2t - 5st^2}{4m^2 - n^2} \div \dfrac{st}{2m-n} \cdot \dfrac{2m+n}{9s^2 - t^2}$

36. $\dfrac{a^3 - ab^2}{a^3 - 4a^2b + 3ab^2} \div \dfrac{-2a^2 + ab + 3b^2}{a - 3b} - \dfrac{a}{3ab - 2b^2}$

37. $\left(\dfrac{2x-5}{3x^2-11x-4}+\dfrac{4}{2x^2-5x-12}\right)\div\dfrac{4x^2+8x-11}{-2x^2+5x+12}$

38. $\dfrac{a^2}{a^2-b^2} - \dfrac{b^2}{a+b} \circ \dfrac{4a^2+2ab-2b^2}{4ab^2-2b^3}$

39. $\dfrac{2x^2+xy}{2x^2+xy-y^2} \div \left(\dfrac{2x+y}{4x^2-4xy+y^2} - \dfrac{2x+y}{2x^2+xy-y^2}\right)$

40. $\left(\frac{2}{1-x^2} - \frac{1}{1+x} + 3\right) \circ (x-1)^2$