32. $\dfrac{12+r-r^2}{r^3+3r^2} = \dfrac{(4-r)\cancel{(3+r)}}{r^2\cancel{(r+3)}} = \dfrac{4-r}{r^2}$

33. $\dfrac{9x^2-4}{3x^2-5x+2} \cdot \dfrac{9x^4-6x^3+4x^2}{27x^4+8x}$

$$= \frac{(3x+2)\cancel{(3x-2)}\,x^{\cancel{2}}(9x^2-6x+4)}{\cancel{(3x-2)}(x-1)\cancel{x}\,\underbrace{(27x^3+8)}}$$

Notice that "$27x^3$" and "$8$" are perfect ~~cud~~ cubes so recall the formula
$(a^3+b^3) = (a+b)(a^2-ab+b^2)$

$$= \frac{\cancel{(3x+2)}\,x\,\cancel{(9x^2-6x+4)}}{(x-1)\cancel{(3x+2)}\cancel{(9x^2-6x+4)}}$$

$$= \frac{x}{x-1}$$

40. $\dfrac{t}{t+3} + \dfrac{4t}{t-3} - \dfrac{18}{t^2-9}$

$$= \frac{t(t-3)}{(t+3)(t-3)} + \frac{4t(t+3)}{(t+3)(t-3)} - \frac{18}{(t+3)(t-3)}$$

$$= \frac{t^2-3t+4t^2+12t-18}{(t+3)(t-3)}$$

$$= \frac{5t^2+9t-18}{(t+3)(t-3)} = \frac{(5t-6)\cancel{(t+3)}}{\cancel{(t+3)}(t-3)} = \frac{5t-6}{t-3}$$

56. $$\cancel{\frac{(x+h)^3 - 3(x+h) - (x^2-3x)}{h}}$$

$$\cancel{= \left[x^3 + 3xh^2 + 3x^2h + h^3\right]}$$

$$\frac{(x+h)^3 + 5(x+h) - (x^3+5x)}{h}$$

$$= \frac{\left[\cancel{x^3} + 3xh^2 + 3x^2h + h^3\right] + \cancel{5x} + 5h - \cancel{x^3} - \cancel{5x}}{h}$$

$$= \frac{3xh^{\cancel{2}} + 3x^2\cancel{h} + h^{\cancel{3}2} + 5\cancel{h}}{\cancel{h}}$$

$$= 3xh + 3x^2 + h^2 + 5$$

59. $$\frac{\frac{1}{(x+h)^3} - \frac{1}{x^3}}{h} = \frac{\frac{x^3-(x+h)^3}{x^3(x+h)^3}}{h} = \frac{x^3-(x+h)^3}{hx^3(x+h)^3}$$

$$= \frac{\cancel{x^3} - \cancel{x^3} - 3x^2\cancel{h} - 3xh^{\cancel{2}} - h^{\cancel{3}2}}{\cancel{h}x^3(x+h)^3}$$

$$= \frac{-3x^2 - 3xh - h^2}{x^3(x+h)^3}$$

61. $\dfrac{\sqrt{t}+5}{\sqrt{t}-5} = \dfrac{\sqrt{t}+5}{\sqrt{t}-5} \cdot \dfrac{\sqrt{t}+5}{\sqrt{t}+5} = \dfrac{(\sqrt{t}+5)^2}{t-25}$

83. $\dfrac{(6x+1)^3(27x^2+2)-(9x^3+2x)(3)(6x+1)^2(6)}{(6x+1)^6}$

$= \dfrac{\cancel{(6x+1)^2}\left[(6x+1)(27x^2+2)-18(9x^3+2x)\right]}{(6x+1)^{\cancel{6}\,4}}$

$= \dfrac{\cancel{162x^3}+12x+27x^2+3-\cancel{162x^3}-36x}{(6x+1)^4}$

$= \dfrac{27x^2-24x+2}{(6x+1)^4}$

88. $\dfrac{(4x^2+9)^{\frac{1}{2}}(2)-(2x+3)\left(\frac{1}{2}\right)(4x^2+9)^{-\frac{1}{2}}(8x)}{\left[(4x^2+9)^{\frac{1}{2}}\right]^2}$

$= \dfrac{2(4x^2+9)^{\frac{1}{2}}-4x(2x+3)(4x^2+9)^{-\frac{1}{2}}}{4x^2+9} \cdot \dfrac{(4x^2+9)}{(4x^2+9)}$

$= \dfrac{2(4x^2+9)-4x(2x+3)}{(4x^2+9)^{\frac{3}{2}}}$