Question 1

n is an integer.

Prove algebraically that $\frac{3}{4}n^2\left(\frac{12}{n}+n\right)+\frac{1}{4}n\left(n^2-36\right)$ is always a cube number.

Question 2

Solve $\frac{x}{3}-\frac{7\,x}{x+7}=6$, writing your solutions correct to 3 decimal places.

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$$\frac{3}{4}n^2\left(\frac{12}{n}+n\right)+\frac{1}{4}n\left(n^2-36\right)$$

$$= 9n+\frac{3}{4}n^3+\frac{1}{4}n^3-9n$$

$$= n^3$$

$= (n)^3$, which is a cube number.

Question 2

Solve $\frac{x}{3}-\frac{7\,x}{x+7}=6$, writing your solutions correct to 3 decimal places.

Multiplying each side by $3(x+7)$, we get

$x^2-14\,x=18\,x+126$

Rearranging, we get $x^2-32\,x-126=0$

Solving using the quadratic formula we see

$x=35.545$, $x=-3.545$