

17. The graph of the function $y = 2x^2 + x + 1$ is stretched vertically about the x -axis by a factor of 2, stretched horizontally about the y -axis by a factor of $\frac{1}{3}$, and translated 2 units to the right and 4 units down. Write the equation of the transformed function.

$$f(x) = 2x^2 + x + 1$$

$$g(x) = a f(b(x-h)) + k = 2 f\left(\frac{1}{3}(x-2)\right) - 4 =$$

$$g(x) = 2 \left(2 \left[\frac{1}{3}(x-2) \right]^2 + \left[\frac{1}{3}(x-2) \right] + 1 \right) - 4$$

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

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

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

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

$$g(x) = 36(x^2 - 4x + 4) + 6(x-2) - 2$$

$$= 36x^2 - 144x + 144 + 6x - 12 - 2$$

$$g(x) = 36x^2 - 138x + 130$$

we could stop here or continue to evolve every term further.

this also gives the equation of

$$\underline{g(x) = 36x^2 - 138x + 130}$$

↪ this also gives the equation of the transformed function $g(x)$.