

Solutions of last day's homework

Thu 24 JAN 2019

1) Given $f(x) = x^2 - 1$

a) $g(t) = f(t-1) = \left(\underline{t-1}\right)^2 - 1$ Already in vertex form

b) $h(t) = g(3t) = \left(\underline{3t} - 1\right)^2 - 1$ ← Not vertex form because of that 3

It must be $3a = -1$
 $\frac{3a}{3} = \frac{-1}{3}$ Hence $a = -\frac{1}{3}$

$$= \left[3\left(t + a\right)\right]^2 - 1 = \left[3\left(t - \frac{1}{3}\right)\right]^2 - 1 = 3^2 \cdot \left(t - \frac{1}{3}\right)^2 - 1 = \boxed{9\left(t - \frac{1}{3}\right)^2 - 1}$$

$$c) r(t) = -\frac{1}{9} h(t) + \frac{8}{9} = -\frac{1}{9} \left[9\left(t - \frac{1}{3}\right)^2 - 1 \right] + \frac{8}{9} \Leftarrow \text{Not in vertex form}$$

$(h(t) = 9\left(t - \frac{1}{3}\right)^2 - 1)$

$$= -\left(t - \frac{1}{3}\right)^2 + \frac{1}{9} + \frac{8}{9} = \boxed{-\left(t - \frac{1}{3}\right)^2 + 1}$$

↓
This is in vertex form

2) Given $h(t) = (t-1)^2$

a) $f(x) = h(7x) - 7 = \left(\frac{7x}{1} - 1\right)^2 - 7 \Leftarrow \text{Not vertex form}$

$$= [7(x + a)]^2 - 7 = [7(x - \frac{1}{7})]^2 - 7 =$$

It must be

$$7a = -1$$

$$\frac{7a}{7} = \frac{-1}{7} \text{ hence } a = \frac{-1}{7}$$

$$= 7^2 \left(x - \frac{1}{7}\right)^2 - 7 =$$

$$= 49 \left(x - \frac{1}{7}\right)^2 - 7$$

$$b) g(x) = f(\underline{3x-2}) = 49\left(\underline{\underline{3x-2}} - \frac{1}{7}\right)^2 - 7 =$$

$$\left(\underline{f(x) = 49\left(x - \frac{1}{7}\right)^2 - 7}\right)$$

$$= 49\left(3x - \frac{2 \cdot 7}{7} - \frac{1}{7}\right)^2 - 7 = 49\left(3x - \frac{15}{7}\right)^2 - 7 =$$

It must be

$$3a = -\frac{15}{7}$$

$$\rightarrow \frac{3a}{3} = \frac{-15/7}{3} \rightarrow a = \frac{-15}{3 \cdot 7} = \frac{-5}{7}$$

$$= 49\left[3\left(x + \frac{5}{7}\right)\right]^2 - 7 = 49\left[3\left(x - \frac{5}{7}\right)\right]^2 - 7 = \quad \downarrow$$

$$\geq 49 \left[3^2 \left(x - \frac{5}{7} \right)^2 \right] - 7 = 49 \cdot 9 \left(x - \frac{5}{7} \right)^2 - 7 =$$

$$= \boxed{541 \left(x - \frac{5}{7} \right)^2 - 7}$$