A.

$$6-2x+\frac{1}{3}x^2-\frac{1}{27}x^3 \qquad \textit{general term} = \frac{6\left(-\frac{1}{3}\right)^k x^k}{k!}$$

B.

$$g(x) \approx \int 6-2x+\frac{1}{3}x^2-\frac{1}{27}x^3$$

$$g(x) \approx 6x-x^2+\frac{1}{9}x^3-\frac{1}{108}x^4$$

$$\text{general term} = \frac{6\left(-\frac{1}{3}\right)^{k+1} x^{k+1}}{(k+1)!}$$

C.

$$f(x) \approx 6-2x+\frac{1}{3}x^2-\frac{1}{27}x^3$$

$$f'(x) \approx -2+\frac{2}{3}x-\frac{1}{9}x^2$$

$$f'(ax) \approx -2+\frac{2ax}{3}-\frac{1}{3}(ax)^2$$

$$kf'(ax) \approx -2k+\frac{2akx}{3}-\frac{k}{3}(ax)^2$$

$$h(x) = 1+x+\frac{x^2}{2}+\frac{x^3}{6}+\ldots$$

$$-2k = 1 \Rightarrow k = -\frac{1}{2}$$

This implies that

$$\frac{2ka}{3} = 1 \Rightarrow \frac{2\left(-\frac{1}{2}\right)a}{3} = 1 \Rightarrow a = -3$$