7. $g(x) = x^3 + 1$

$g'(x) = 3x^2$

$g''(x) = 6x$

$g'''(x) = 6$

Taylor Pol.:

$$g(x) = g(0) + g'(0)(x - x_0) + \frac{g''(0)(x - x_0)^2}{2} + \frac{g'''(0)(x - x_0)^3}{3!}$$

$$g(x) = 1 + 0 + 0 + \frac{6x^3}{6} = 1 + x^3$$

∴ Taylor Polynomial around 0 of $g(x) = x^3 + 1$ is $x^3 + 1$.

8. $f(t) = 1 + \sin(t)$ → odd function period $p = 2\pi$

$$f(t) \sim A_0 + \sum_{n=1}^{\infty} A_n \sin\left(\frac{2\pi n t}{2\pi}\right) = A_0 + \sum_{n=1}^{\infty} A_n \sin(nt)$$

in this case, let $A_0 = 1$ and $A_1 = 1$, $A_n = 0$ for $n > 1$

then $f(t) \sim 1 + \sin(t)$ is our Fourier series ($f(t)$ is its own Fourier series)