複素数 $\alpha = \cos\dfrac{2\pi}{7} + i\sin\dfrac{2\pi}{7}$ に対し, 次の式の値を求めよ。

(1) $\alpha + \alpha^2 + \alpha^3 + \alpha^4 + \alpha^5 + \alpha^6$

(2) $\dfrac{1}{1-\alpha} + \dfrac{1}{1-\alpha^6}$

(3) $\dfrac{1}{1-\alpha} + \dfrac{1}{1-\alpha^2} + \dfrac{1}{1-\alpha^3} + \dfrac{1}{1-\alpha^4} + \dfrac{1}{1-\alpha^5} + \dfrac{1}{1-\alpha^6}$

(4) $\dfrac{\alpha^2}{1-\alpha} + \dfrac{\alpha^4}{1-\alpha^2} + \dfrac{\alpha^6}{1-\alpha^3} + \dfrac{\alpha^8}{1-\alpha^4} + \dfrac{\alpha^{10}}{1-\alpha^5} + \dfrac{\alpha^{12}}{1-\alpha^6}$

（神戸大）