Math 2280-2, Fall 2008, Broken air conditioner

$> a_0 := 80 : a_1 := -5 : a_2 := -5\,\mathrm{sqrt}(3) : \omega := \frac{\pi}{12} : \; k := 0.2 :$

$> A(t) = a_0 + a_1 \cdot \cos(\omega \cdot t) + a_2 \cdot \sin(\omega \cdot t)$

$$A(t) = 80 - 5\cos\left(\frac{1}{12}\,\pi\,t\right) - 5\sqrt{3}\,\sin\left(\frac{1}{12}\,\pi\,t\right) \tag{1}$$

$> c_1 := \frac{\left(k^2 \cdot a_1 - k \cdot \omega \cdot a_2\right)}{k^2 + \omega^2}; c_2 := \frac{\left(k \cdot \omega \cdot a_1 + k^2 a_2\right)}{k^2 + \omega^2};$

$$\frac{-0.20 + 0.08333333335\,\pi\sqrt{3}}{0.04 + \frac{1}{144}\,\pi^2} \qquad \frac{-0.08333333335\,\pi - 0.20\sqrt{3}}{0.04 + \frac{1}{144}\,\pi^2} \tag{2}$$

$> \mathrm{evalf}(c_1); \mathrm{evalf}(c_2);$

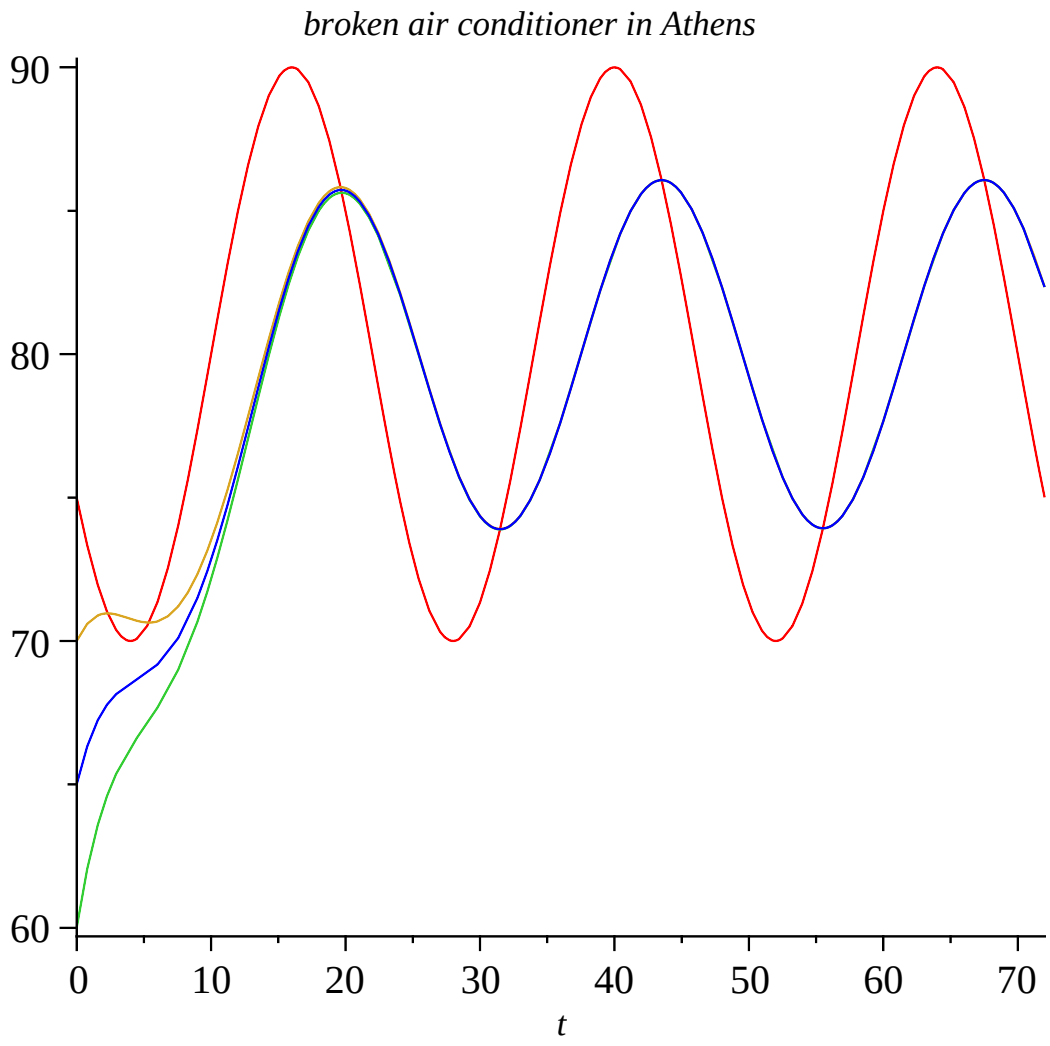
$$2.335105624 \qquad -5.603607925 \tag{3}$$

$> A := t \to a_0 + a_1 \cdot \cos(\omega \cdot t) + a_2 \cdot \sin(\omega \cdot t);$

$u := (t, u0) \to a_0 + c_1 \cdot \cos(\omega \cdot t) + c_2 \cdot \sin(\omega \cdot t) + (u0 - a_0 - c_1) \cdot \exp(-k \cdot t);$

$$t \to a_0 + a_1\cos(\omega\,t) + a_2\sin(\omega\,t) \qquad (t, u0) \to a_0 + c_1\cos(\omega\,t) + c_2\sin(\omega\,t) + (u0 - a_0 - c_1)\,e^{-kt} \tag{4}$$

$> \mathrm{plot}(\{u(t, 70), u(t, 60), u(t, 65), A(t)\}, t = 0..72, \mathrm{title} = \text{‘broken air conditioner in Athens‘});$


broken air conditioner in Athens
90
80
70
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> ‘?‘