Solutions to Homework Assignment 21

MATH 345

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1. (a) $\dfrac{d}{dt}((x_0 + iy_0)(u + iv)) = \dfrac{d}{dt}((x_0u - y_0v) + i(x_0v + y_0u)) = (x_0u' + y_0v') + i(x_0v' + y_0u') = (x_0 + iy_0)(u' + iv') = z_0w'(t)$.

   (b) $\dfrac{d}{dt}(w(t))^2 = \dfrac{d}{dt}(u^2 - v^2 + 2iuv) = 2uu' - 2vv' + 2i(uv' + vu') = 2(u' + iv')(u + iv) = 2w(t)w'(t)$.

2. You can do these.

4. On the left, we find $\displaystyle\int_0^\pi e^{(1+i)x}dx = \frac{1}{1+i}e^{(1+i)x}\Big|_0^\pi = \frac{1}{1+i}e^{\pi+i\pi} - \frac{1}{1+i} = \frac{(1-i)(-1-e^\pi)}{2}$. The real part is $\dfrac{-1-e^\pi}{2}$, and the imaginary part is $\dfrac{1+e^\pi}{2}$.

5. $\displaystyle\int_0^{2\pi} e^{it}dt = \int_0^{2\pi} \cos t + i\sin t dt = 0$. However, e^{it} is never zero, so no such c can exist.