

## Math 143 Quiz 3

Names: \_\_\_\_\_

1. Euler's amazing formula is  $e^{it} = \cos t + i \sin t$ . Use this to explain why this identity is true:

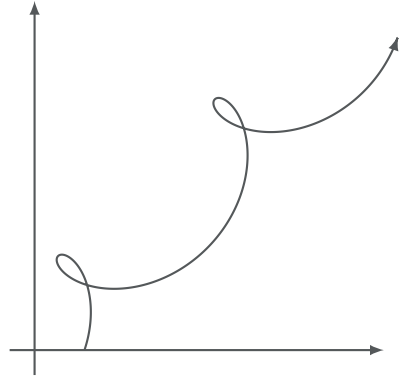
$$(\cos t + i \sin t)^n = \cos(nt) + i \sin(nt).$$

2. Use Euler's formula to expand both sides of the equation  $e^{(a+b)i} = e^{ai}e^{bi}$  in terms of sines and cosines. Compare the real and imaginary components to explain why these two identities are true:

$$\cos(a + b) = \cos a \cos b - \sin a \sin b,$$

$$\sin(a + b) = \cos a \sin b + \cos b \sin a.$$

- 3.** Find the equation of the line tangent to the curve  $\begin{cases} x = \cos(2t) + t, \\ y = \sin(2t) + t, \end{cases}$  for  $t \in \mathbb{R}$  at the point  $(1 + \pi, \pi)$ .



- 4.** Find the values of  $t$  for which there are vertical tangent lines in the graph in question 3.