

## Math 128A Quiz 3

1)(5 pts) Let  $f(x) = \cos(\pi x)$ ,  $x_0 = 0$ , and  $x_1 = 1$ . Find a cubic polynomial  $P(x)$  such that for  $i = 1, 2$ ,  $P(x_i) = f(x_i)$  and  $P'(x_i) = f'(x_i)$ . (Hint: Reduce the problem to a system of equations)

2)(5 pts) Let  $f(x) = \int_0^x \arctan(t) dt$ . Find a value of  $h$  such that for all  $x_0 \in \mathbb{R}$ , the polynomial which interpolates  $f(x)$  at the points  $x_0$  and  $x_1 = x_0 + h$  has an error of at most  $10^{-100}$ . (Hint:  $\frac{d}{dx} \arctan(x) = \frac{1}{1+x^2}$  and  $f(x) = P(x) + \frac{f^{(n+1)}(\xi(x))}{(n+1)!} (x - x_0)(x - x_1) \dots (x - x_n)$ )