

hw 13

1.  $\arctan(1) = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$

$$\frac{\pi}{4} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$$

$$\pi = 4 \left( 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots \right)$$

1.1  $4 \left( 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \frac{1}{9} - \frac{1}{11} + \frac{1}{13} - \frac{1}{15} + \frac{1}{17} - \frac{1}{19} \right) = 3.04183962$

error from  $\pi$ : 0.09975

2.  $\arctan(1/2) + \arctan(1/3) = \arctan\left(\frac{1/2 + 1/3}{1 - 1/6}\right) = \arctan(1)$

$$\tan\left(\frac{\pi}{4}\right) = 1, \quad \arctan(1) = \pi/4$$

2.  $\pi = 4 \left( \arctan(1/2) + \arctan(1/3) \right)$

$$\arctan(1/3) \approx (1/3) / \left( 1 - (1/3)^2 \right)^{1/2} + 1/3^3 = 0.3218$$

$$\arctan(1/2) \approx 1/2 - \frac{1}{2^3} + \frac{1}{2^5} = 0.46458$$

$$\approx 3.145$$

$$\approx 3.15$$

3.  $\pi = 16 \arctan(1/5) - 4 \arctan(1/239)$

$$\approx 3.142$$

4.  $\frac{128}{\pi^2} \approx 12.96911$

$$\pi \approx \sqrt{128 / 12.96911}$$

6 digits after the decimal