Homework 1

Due date: Thu Sep 26th 2019

Problem 1

For $b = 1.2$, $a = 1.5b$, and $v = 0.3$, determine κ when

$$\kappa = \frac{(40 + 37v)b^4 + (16 + 10v)a^2b^2 + va^4}{12(1 + v)b^2(3b^2 + a^2)}$$

Problem 2

For $\gamma_1 = 0.6$, $\gamma_2 = 0.4$, and $m_o = 0.71$, determine Ω_c when

$$\Omega_c = \frac{1}{\sqrt{\gamma_1^3 \gamma_2^3 \left(m_o + \alpha + \beta\right)}}$$

and

$$\alpha = \gamma_1 \left[\frac{\left(3\gamma_1 + \gamma_2\right)^2}{28\gamma_2^2} + \frac{9}{20\gamma_2^2} - \frac{3\gamma_1 + \gamma_2}{4\gamma_2^2} \right]$$

$$\beta = \gamma_2 \left[\frac{\left(3\gamma_2 + \gamma_1\right)^2}{28\gamma_1^2} + \frac{9}{20\gamma_1^2} - \frac{3\gamma_2 + \gamma_1}{4\gamma_1^2} \right]$$

Problem 3

For $n = 5$, determine the value of c when

$$c = \frac{M \left(1 - M^2\right) \sin \alpha}{\left(1 + M^2 - 2M \cos \alpha\right)^2}$$

and

$$\cos \alpha = \sqrt{\left(\frac{1 + M^2}{4M}\right)^2 + 2} - \left(\frac{1 + M^2}{4M}\right)$$

$$M = \frac{1}{\sin \left(\pi / n\right)}$$

Problem 4

For $g = 9.81$, $\theta = 17°$, $x = 45$, and $v_o = 14$, determine z when

$$z = -\frac{gx^2}{2v_o^2 \cos^2 \theta} + x \tan \theta$$

Problem 5

Show numerically using 50 digits of precision that

$$\sin(\pi/15) = \frac{1}{4}\sqrt{7 - \sqrt{5} - \sqrt{30 - 6\sqrt{5}}}$$