

Wk 2 : Linearization. Part 1

$$1. T = 2\pi\sqrt{\frac{m}{k}} = 2\pi\sqrt{m} \sqrt{\frac{1}{k}}$$

$\sqrt{1/k}$ (s ²)	T	slope = 3.1308 = $2\pi\sqrt{m}$ $m = \left(\frac{3.1308}{2\pi}\right)^2$ $= 0.250 \text{ kg}$
$\sqrt{1/10}$	.893	
$\sqrt{1/15}$	.841	
$\sqrt{1/20}$	.702	
$\sqrt{1/25}$	.628	$y = (\text{slope})x + c$
$\sqrt{1/30}$	.574	Slope = 3.1308
$\sqrt{1/40}$	.497	$c = 0.00047$
$\sqrt{1/50}$	.444	slope = $2\pi\sqrt{m}$ $m = \left(\frac{\text{slope}}{2\pi}\right)^2 = 0.250 \text{ kg}$

$$2. c = 0.00047 \text{ seconds}$$

Reasons: Inaccuracy in the period T, air resistance, deformation of the spring

Part 2

$$T = 2\pi\sqrt{\frac{L}{g}} = 2\pi\sqrt{\frac{1}{g}} \sqrt{L}$$

\sqrt{L}	T	$T = \text{slope} \sqrt{L}$
$\sqrt{0.2}$	.897	slope = 2.0193
$\sqrt{0.3}$	1.10	$2\pi\sqrt{\frac{1}{g}} = \text{slope}$
$\sqrt{0.4}$	1.27	$\Rightarrow \frac{1}{g} = \left(\frac{\text{slope}}{2\pi}\right)^2$
$\sqrt{0.5}$	1.42	$\Rightarrow g = \left(\frac{2\pi}{\text{slope}}\right)^2$
$\sqrt{0.6}$	1.55	
$\sqrt{0.75}$	1.74	
$\sqrt{1.00}$	2.01	$\Rightarrow g = 9.762 \text{ m/s}^2$

$$s = \sqrt{\frac{m}{k}}$$

$$s^2 = \frac{m}{k}$$

$$? = \frac{m}{k}$$

$$\text{Intercept} = c = -0.0025 \text{ sec.}$$