No.

Date

HW 2 : Linearization. Part 1

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

$\sqrt{1/k}$ (slope)	T
$\sqrt{\frac{1}{10}}$	.893
$\sqrt{\frac{1}{15}}$	.811
$\sqrt{\frac{1}{20}}$	.702
$\sqrt{\frac{1}{25}}$	.628
$\sqrt{\frac{1}{30}}$	.574
$\sqrt{\frac{1}{40}}$	.497
$\sqrt{\frac{1}{50}}$	.444

~~$T = 2\pi\sqrt{m}$~~

~~$m = \left(\frac{T}{2\pi}\right)^2$~~

~~$= 0.250$ kg~~

$y = (\text{slope})x + c$

slope $= 3.13808$

$c = 0.00047$

slope $= 2\pi\sqrt{m}$

$m = \left(\frac{\text{slope}}{2\pi}\right)^2 = \boxed{0.250 \text{ kg}}$

2. $c = 0.00047$ seconds

Reasons: Imprecision 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
$\sqrt{0.2}$	.897
$\sqrt{0.3}$	1.10
$\sqrt{0.4}$	1.27
$\sqrt{0.5}$	1.42
$\sqrt{0.6}$	1.55
$\sqrt{0.75}$	1.74
$\sqrt{1.00}$	2.01

$T = \text{slope}\sqrt{L}$

slope $= 2.1093$

$2\pi\sqrt{\frac{1}{g}} = \text{slope}$

$\Rightarrow \frac{1}{g} = \left(\frac{\text{slope}}{2\pi}\right)^2$

$\Rightarrow g = \left(\frac{2\pi}{\text{slope}}\right)^2$

$\Rightarrow g = \boxed{9.762 \text{ m/s}^2}$

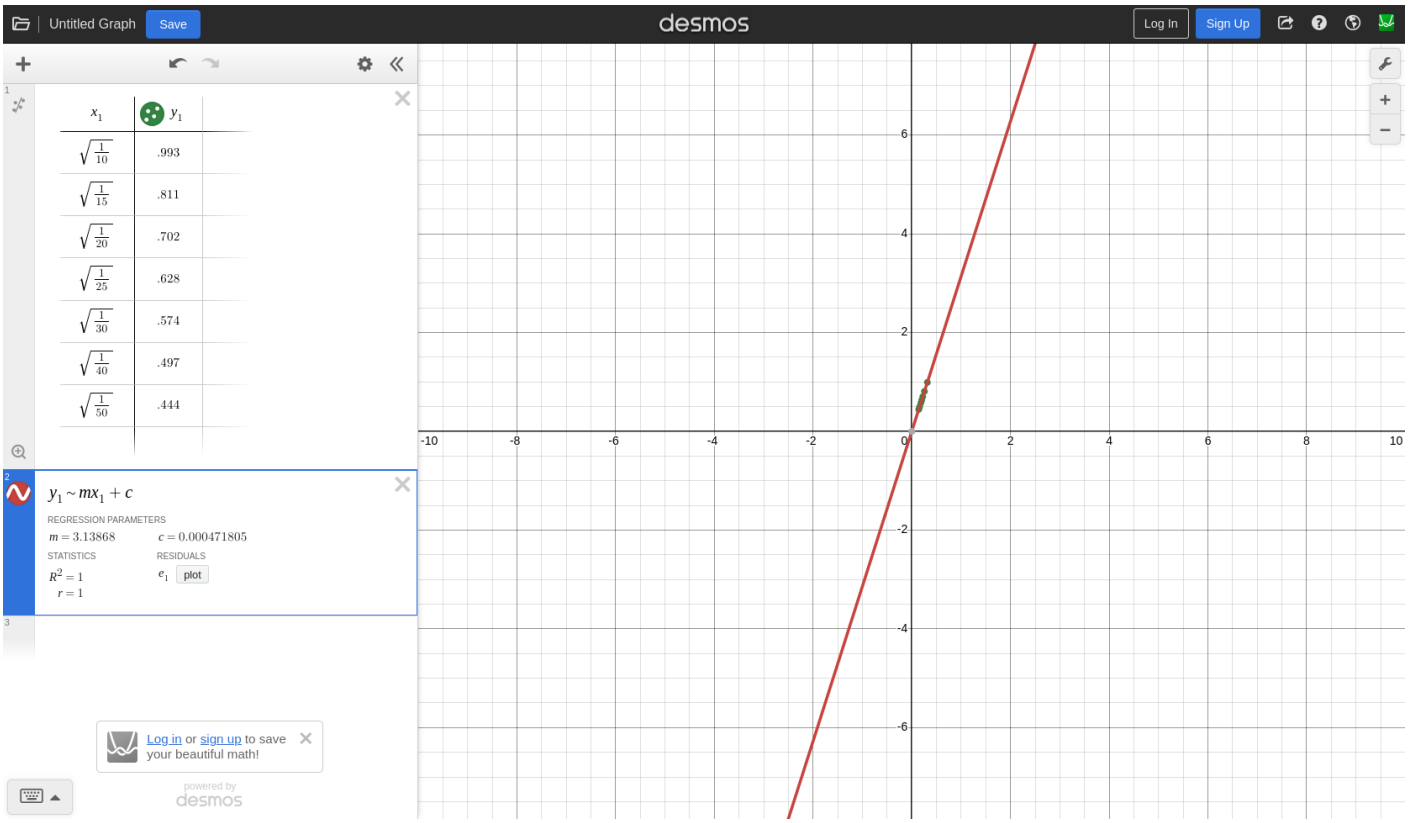
$s = \sqrt{\frac{m}{k}}$

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

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

intercept $= c = \underline{-0.0025 \text{ sec.}}$

Part 1


Untitled Graph
Save
desmos
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x_1
y_1
$\sqrt{\frac{1}{10}}$ .993
$\sqrt{\frac{1}{15}}$ .811
$\sqrt{\frac{1}{20}}$ .702
$\sqrt{\frac{1}{25}}$ .628
$\sqrt{\frac{1}{30}}$ .574
$\sqrt{\frac{1}{40}}$ .497
$\sqrt{\frac{1}{50}}$ .444
$y_1 \sim mx_1 + c$
REGRESSION PARAMETERS
$m = 3.13868$
$c = 0.000471805$
STATISTICS
$R^2 = 1$
$r = 1$
RESIDUALS
e_1 plot
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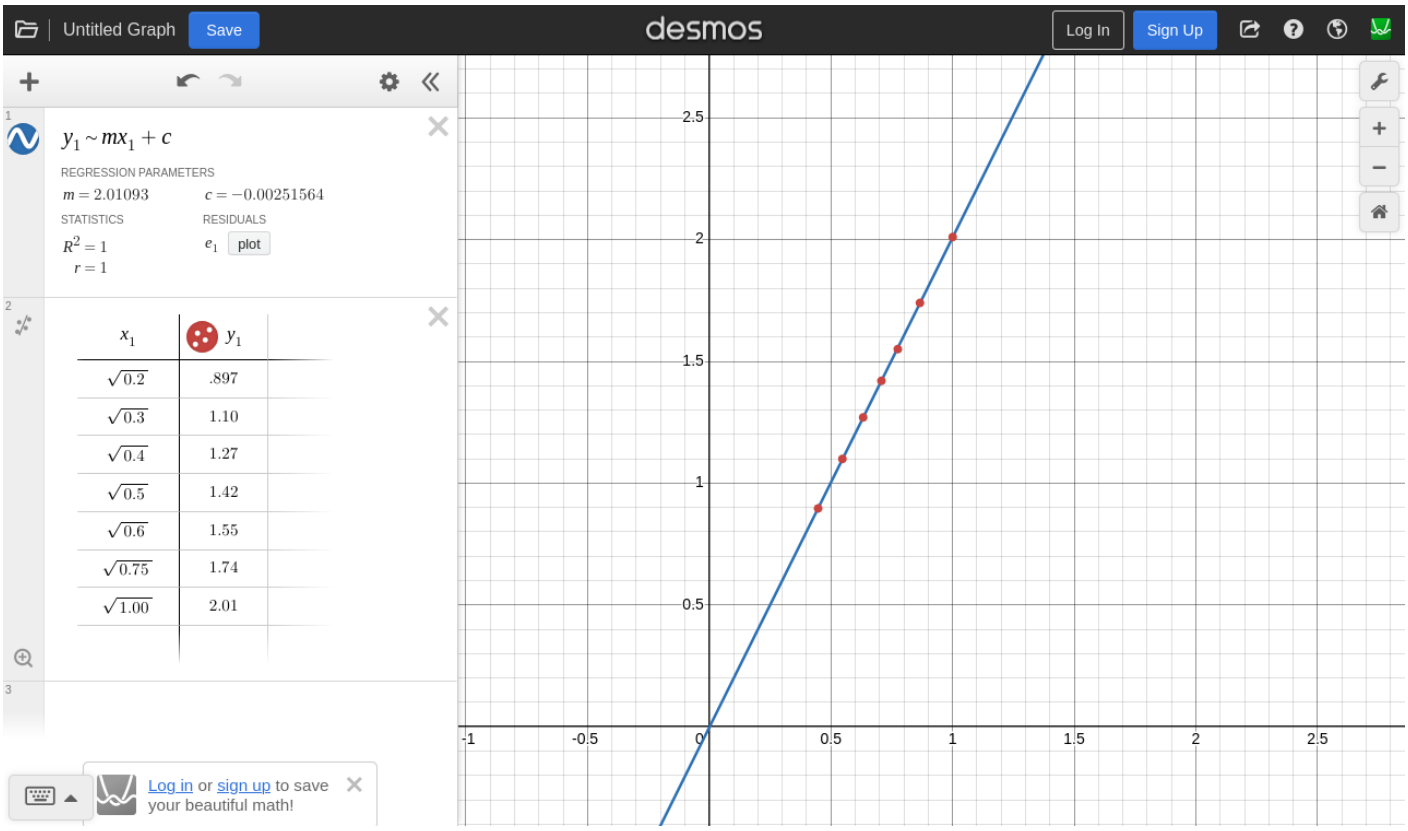
Part 2


Untitled Graph
Save
desmos
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$y_1 \sim mx_1 + c$
REGRESSION PARAMETERS
$m = 2.01093$
$c = -0.00251564$
STATISTICS
$R^2 = 1$
$r = 1$
RESIDUALS
e_1 plot
x_1
y_1
$\sqrt{0.2}$ .897
$\sqrt{0.3}$ 1.10
$\sqrt{0.4}$ 1.27
$\sqrt{0.5}$ 1.42
$\sqrt{0.6}$ 1.55
$\sqrt{0.75}$ 1.74
$\sqrt{1.00}$ 2.01
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