EASTERN UNIVERSITY, SRI LANKA

FIRST YEAR EXAMINATION IN SCIENCE - 2016/2017

FIRST SEMESTER(Aug./Sep., 2018)

MT 1222 - MATHEMATICAL SOFTWARE

Answer all questions

Time: Three hours

MATHEMATICA

1. (a) i. Compute numerical approximations to the square root and cube root of 10 accurate to 20 significant digits.

ii. Determine the integer closest to $\sqrt{159}$.

iii. Select a random number x, between 0 and 1 and compute $\sin^2 x + \cos^2 x$.

iv. Approximate the sum $\frac{1}{15} + \frac{1}{17} + \frac{1}{19} + \ldots + \frac{1}{51}$.

v. Print all numbers from 1 to 20, which are not multiples of 2, 3, and 5.

[5 Marks]

(b) Create a 5×5 zero matrix.

i. Set the second column as $\{1, 2, 3, 4, 5\}$.

ii. Set the third column as all entry 3.

iii. Add a new row range from 10 to 14.

[6 Marks]

(c) Consider the list $\{a, b, c, d, e, f, g, h, i\}$.

i. Insert an element p at the fourth position.

ii. Replace the elements at position three and seven by 2 and 3.

iii. Place x at prime-numbered positions. Note that the position is be primality, not for value.

(d) Compute the values of the first ten derivatives of $f(x) = e^{x^2}$ at $x = 0$ and g in tabular form.

Q2.(a) Sketch the graphs of the functions $y = -x^2$, $y = x^2$ and $y = x^2 \sin\left(\frac{1}{x}\right)$ o $[0.02, 0.02]$ on one set of axes.

(b) Let P be a point at a distance a from the center of a circle of radius r. The by P as the circle rolls along a straight line is called a trochoid. Its parame are $x = r\theta \sin\theta$, $y = r - a\cos\theta$.

i. Sketch the trochoid with $r = 1$, $a = \frac{1}{2}$ as the circle makes four revolu

ii. What would the graph look like if $r = 1$, $a = 2$ so that the point circle?

(c) Plot the given function, which is parameterized by the following equations

$$x(t) = \cos t - \cos 100t \sin t,$$
$$y(t) = 2\sin t - \sin 100t.$$

(d) Consider the range $0 \leq t \leq 2\pi$. If p dollars are compounded n times p annual interest rate of r, the money will be worth $p\left(1 + \frac{r}{n}\right)^{nt}$ dollars after much will the money be worth after t years if it is compounded continuou

(e) Given $f(x)$ whose graph is C, the slope of the line tangent to C at a $f(x) = \sin x$. Sketch the graph and its tangent line at $a = \frac{\pi}{3}$.