BIRZEIT UNIVERSITY

MATHEMATICS DEPARTMENT
MATH1321 -Second Exam-
Second Semester 2017/2018

- Name (Arabic)........KEY........
- Number..

- Circle your discussion's section number from the table below:

#	Discussion teacher	Time
1	Duha Sharha	S 11:00 - 11:50
2	Leen Hethnawi	S 13:00 - 13:50
3	Khaled Altakhman	R 09:00 - 09:50
4	Hiba Sharha	T 10:00 - 10:50
5	Leen Hethnawi	T 11:00 - 11:50
6	Areej Awawhah	T 11:00 - 11:50
7	Duha Sharha	S 12:00 - 12:50
8	Duha Sharha	S 09:00 - 09:50
9	Hasan Yousef	T 13:00 - 13:50
10	Hiba Sharha	S 14:00 - 14:50
11	Hasan Yousef	R 10:00 - 10:50
12	Areej Awawhah	T 12:00 - 12:50
13	Areej Awawhah	S 15:00 - 15:50
14	Duha Sharha	R 09:00 - 09:50
15	Hiba Sharha	S 10:00 - 10:50
16	Leen Hethnawi	S 12:00 - 12:50
17	Duha Sharha	R 13:00 - 13:50
18	Duha Sharha	R 14:00 - 14:50
19	Areej Awawhah	R 08:00 - 08:50

Q1) [68 pts] **Circle the most correct answer.**

(1) The slope of the curve $x = \cos t, y = \sin t$ at $t = \frac{\pi}{4}$ is

(a) 1

(b) -1

(c) $-\frac{1}{2}$

(d) 0

(2) If $x = \cos t, y = \sin t$, then $\frac{d^2y}{dx^2}$ at $t = \frac{\pi}{4}$ is

(a) $2\sqrt{2}$

(b) $\sqrt{2}$

(c) $-2\sqrt{2}$

(d) $\frac{-1}{\sqrt{2}}$

(3) The sum of the series $1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} + \cdots$ is

(a) $e - 1$

(b) $e + 1$

(c) e

(d) This series is divergent

(4) The Taylor polynomial of order 3 at $a = 1$ of $f(x) = x^3 + 2x + 1$ is

(a) $3 - 5(x-1) + 2(x-1)^2 - (x-1)^3$

(b) $4 + 5(x-1) + 3(x-1)^2 + (x-1)^3$

(c) $3 + 5(x-1) + (x-1)^2 + 2(x-1)^3$

(d) $3 + 5(x-1) + 3(x-1)^2 + (x-1)^3$

(5) The cartesian form of the parametric equations: $x = 2\tan t, y = 4\sec t$ is

(a) $\frac{y^2}{16} - \frac{x^2}{4} = 1$

(b) $\frac{x^2}{4} - \frac{y^2}{16} = 1$

(c) $\frac{y^2}{16} + \frac{x^2}{4} = 1$

(d) None of the above.

(6) A polar coordinate of the point $(-1, \sqrt{3})$ is

(a) $(2, \frac{3\pi}{4})$

(b) $(-2, -\frac{\pi}{3})$

(c) $(-2, \frac{2\pi}{3})$

(d) $(2, \frac{5\pi}{3})$

(7) The Maclaurin series of $f(x) = \sqrt{1-x}$ is

(a) $1 + \frac{x}{2} + \frac{x^2}{8} + \frac{x^3}{16} + \cdots$

(b) $1 + \frac{x}{2} - \frac{x^2}{8} + \frac{x^3}{16} - \cdots$

(c) $1 - \frac{x}{2} - \frac{x^2}{8} - \frac{x^3}{16} - \cdots$

(d) $1 - \frac{x}{2} + \frac{x^2}{8} - \frac{x^3}{16} + \cdots$

(8) The Maclaurin series of $f(x) = \frac{x}{1-x}$ is

(a) $\sum\limits_{n=0}^{\infty} (-1)^n x^{n+1}$

(b) $\sum\limits_{n=1}^{\infty} x^{n+1}$

(c) $\sum\limits_{n=0}^{\infty} x^{n+2}$

(d) $\sum\limits_{n=0}^{\infty} x^{n+1}$

(9) The equation $x^2 + (y-2)^2 = 4$ has the polar form

(a) $r = 4\sin\theta$

(b) $r = 4\cos\theta$

(c) $r^2 = 4\cos\theta$

(d) $r^2 = 4\sin\theta$

(10) The sum of the series $\frac{\pi}{2} - \frac{(\frac{\pi}{2})^3}{3!} + \frac{(\frac{\pi}{2})^5}{5!} - \frac{(\frac{\pi}{2})^7}{7!} + \cdots$ is

(a) 1

(b) -1

(c) 0

(d) This series is divergent

(11) The Maclaurin series for $f(x) = \cosh x$ is

(a) $\sum\limits_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}$

(b) $\sum\limits_{n=0}^{\infty} \frac{x^{2n}}{(2n)!}$

(c) $\sum\limits_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!}$

(d) $\sum\limits_{n=0}^{\infty} \frac{x^{2n+1}}{(2n+1)!}$

(12) $1 + \ln 2 + \frac{(\ln 2)^2}{2!} + \frac{(\ln 2)^3}{3!} + \cdots =$

(a) $\sqrt{e}$

(b) e^2

(c) 2

(d) 4

(13) The point $(2, -\frac{\pi}{6})$ has the other polar coordinate

(a) $(-2, \frac{\pi}{3})$

(b) $(2, \frac{7\pi}{6})$

(c) $(2, \frac{2\pi}{3})$

(d) $(-2, \frac{5\pi}{6})$

(14) The interval of convergence of the Maclaurin series of $f(x) = e^x \cos x$ is

(a) $(-\frac{\pi}{2}, \frac{\pi}{2})$

(b) $(-1, 1)$

(c) $(-\infty, \infty)$

(d) None of the above.

(15) The equivalent cartesian equation of $r^2 = 2r \sin\theta$ is

(a) $x^2 + (y+1)^2 = 1$

(b) $(x-1)^2 + y^2 = 1$

(c) $x^2 + y^2 = 2y$

(d) $(x-1)^2 + (y-1)^2 = 1$

(16) The parametric equation: $x = \sqrt{t}, y = t - 1, 0 \leq t \leq 1$ represents

(a) The part of the parabola $y = x^2 - 1$ in the second quadrant.

(b) The part of the parabola $y = x^2 - 1$ in the third quadrant.

(c) The part of the parabola $y = x^2 - 1$ in the fourth quadrant.

(d) The part of the parabola $y = x^2 - 1$ in the first quadrant.

(17) For what values of x we can replace $\cos x$ by $1 - \frac{x^2}{2!}$ with an error of magnitude less than or equal 0.01?

(a) $|x| \leq 1$

(b) $|x| \leq \sqrt[5]{0.12}$

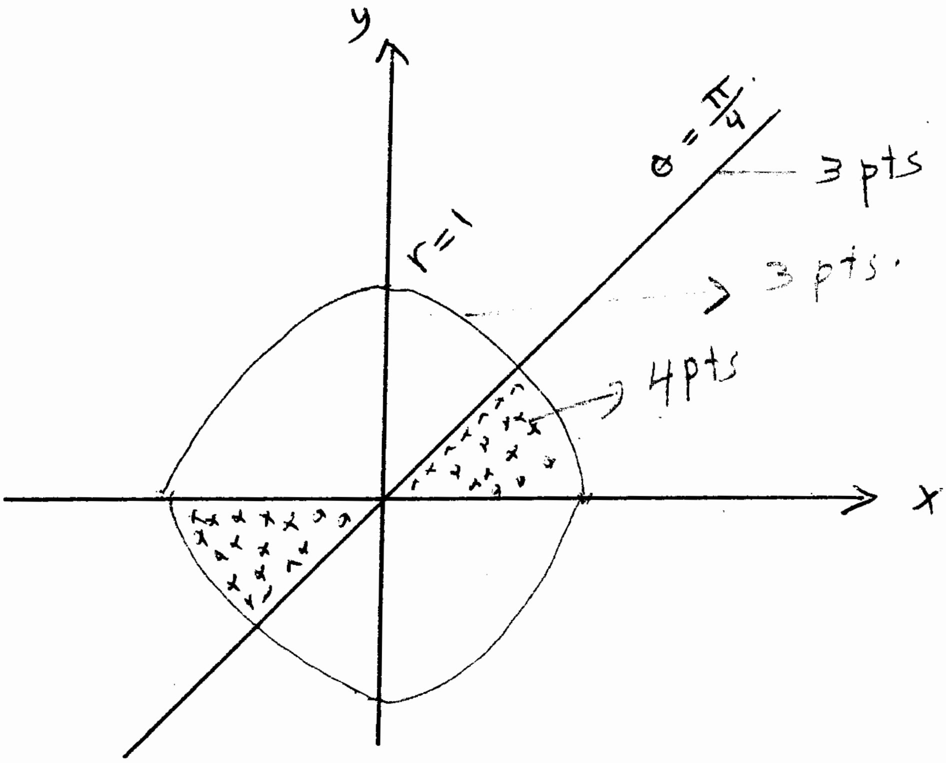
(c) $|x| \leq \sqrt[6]{0.72}$

(d) $|x| \leq \sqrt[4]{0.24}$

Q2) [20 pts] (10 pts each)

(a) Graph the set of points whose polar coordinates satisfy the following conditions:

$0 \le \theta \le \frac{\pi}{4}$ and $-1 \le r \le 1$



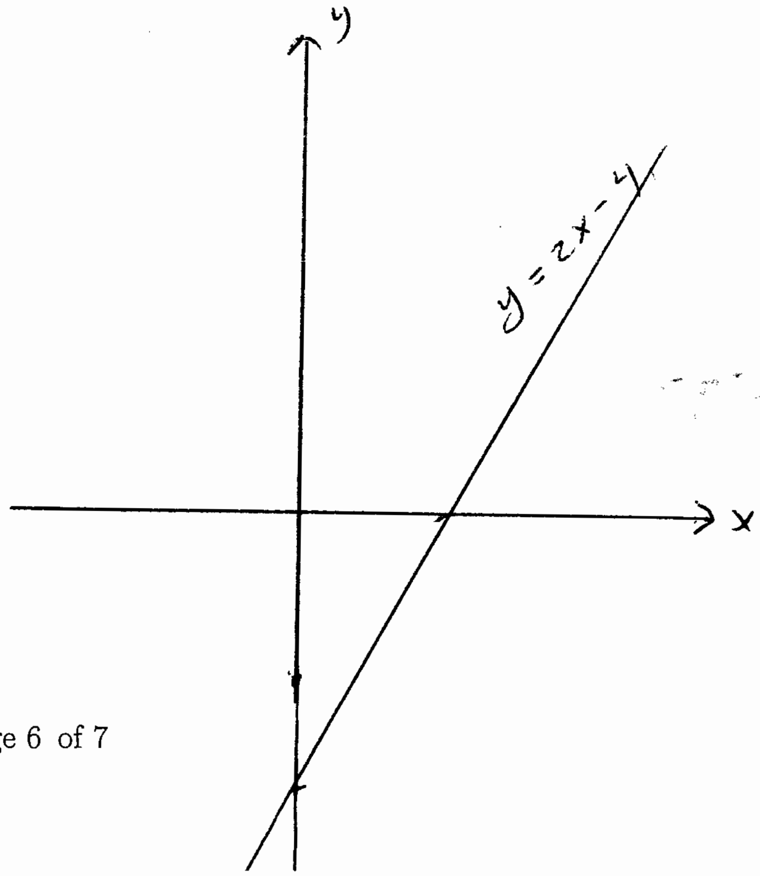
(b) Replace the following polar equation by the equivalent cartesian equation and sketch the graph

$$r = \frac{4}{2\cos\theta - \sin\theta}$$

$2r\cos\theta - r\sin\theta = 4$

$2x - y = 4$

5 pts $y = 2x - 4$



Q3) [20 pts] (10 pts each)

(a) Find a parametrization of the line segment from the point $(0,2)$ ending with point $(4,0)$

$$(x,y) = (0,2) + t(4,-2)$$

(4pts) — $x = 4t$ $\qquad t \in [0,1]$ — (2 pts)

(4pts) ← $y = 2-2t$

other solutions are possible

(b) Find the length of the curve: $x = t^3, y = \frac{3t^2}{2}, 0 \le t \le 2$

$$L = \int_0^2 \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt \qquad 2\text{ pts}$$

$$= \int \sqrt{9t^4 + 9t^2}\, dt \qquad 4\text{ pts}$$

$$= 3\int t\sqrt{t^2+1}\, dt \qquad \text{let } u = t^2+1, \; du = 2t\,dt$$

2pts $\quad = \frac{3}{2}\int_1 u^{\frac{1}{2}} du = u \Big|_1^5 =$