

Exam

Name:

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THIS

- (1) Find a power series representation, and its interval of convergence

(Hint: $x^2 - 2x = (x-1)^2 - 1$.)

$$\frac{1}{x^2 - 2x} = \frac{1}{-1 + (x-1)^2} = \frac{-1}{1 - (x-1)^2}$$

The series converges only if
and the interval of convergence

- (2) Find the exact value of the series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1} n^2}{2^{n/2}}$. (Hint: $\frac{1}{1-x}$)

$$\frac{d}{dx} \frac{x}{(1-x)^2} = \frac{1+x}{(1-x)^3} = \sum_{n=1}^{\infty} \dots$$

$$\frac{1-x}{(1+x)^3} = \sum_{n=1}^{\infty} \dots$$

$$x \frac{1-x}{(1+x)^3} = \sum_{n=1}^{\infty} \dots$$

$$\sqrt{2} (\sqrt{2}-1)^4 = \frac{1}{\sqrt{2}} \frac{1-1/\sqrt{2}}{(1+1/\sqrt{2})^3} = \dots$$

(3) An

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(H

(4) Find

(Hi

(5) Find

(6) Comp

$$\left\langle \frac{1-}{1+} \right\rangle$$

B

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(8) Fin

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c

(9) Compute the limit

We have

so that

$$\lim_{(x,y) \rightarrow (0,0)}$$

(10) Show that all tangents

At a point
the gradient
and the

$$(-2)^{y/x_0}$$

Since

$$-x_0$$

$$= -x_0$$

$$= 0$$

any

(11)

(12)

8 7

(13) Find

at

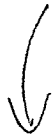
at

(14) Find

(15) Find the (absolute) mi

Over the disc

$$z^{-2} =$$



the min value
attained at
point of t
circle with

(16) Compute the integral \int

By Fubini

(17) Compute the integ

$$\int_0^1 \frac{1}{\sqrt{1-x^2}} dx = \arcsin x \Big|_0^1 = \frac{\pi}{2}$$

(18) Compute the volun

$$\int_0^1 \int_0^{\sqrt{1-x^2}} \sqrt{1-x^2-y^2} dy dx = \int_0^1 \left[\frac{1}{2} (1-x^2-y^2)^{3/2} \Big|_0^{\sqrt{1-x^2}} \right] dx = \int_0^1 \frac{1}{2} (1-x^2)^{3/2} dx$$

$$= \frac{1}{2} \int_0^1 (1-x^2)^{3/2} dx = \frac{1}{2} \int_0^{\pi/2} \cos^4 \theta d\theta = \frac{1}{2} \int_0^{\pi/2} \frac{3}{8} \cos^2 \theta + \frac{1}{8} d\theta = \frac{1}{2} \left[\frac{3}{16} \theta + \frac{3}{32} \sin 2\theta + \frac{1}{16} \theta \right]_0^{\pi/2} = \frac{1}{2} \cdot \frac{\pi}{4} = \frac{\pi}{8}$$

(19) Use a double integral to find the area of the circle $x^2 + y^2 = 4$.

the circle is
the "maxim

By using
the region
 \iint_D
 \ominus

(20) Compute the volume of a sphere of radius 1. (Hint: use spherical coordinates, which $dV = \rho^2 \sin \phi \, d\rho \, d\phi \, d\theta$.)

The integral
 $\int_0^\pi \int_0^{2\pi} \int_0^1$

$$= 2\pi$$

$$= 2\pi$$

$$=$$

$$=$$