NAME ______________________________

STUDENT ID ______________________________

REC. INSTR. ________________ REC. TIME ________________

INSTRUCTIONS:

1. Verify that you have all the pages (there are 6 pages).
2. Fill in your name, your student ID number, and your recitation instructor's name and recitation time above. Write your name, your student ID number and division and section number of your recitation section on your answer sheet, and fill in the corresponding circles.
3. Mark the letter of your response for each question on the mark–sense answer sheet.
4. There are 11 problems worth 9 points each.
5. No books or notes or calculators may be used.

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!} \qquad , |x| < \infty$$

$$\sin x = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!} \qquad , |x| < \infty$$

$$\cos x = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n}}{(2n)!} \qquad , |x| < \infty$$

$$(1+x)^s = \sum_{n=0}^{\infty} \binom{s}{n} x^n, \ |x| < 1$$

$$\ln(1+x) = \sum_{n=1}^{\infty} (-1)^{n+1} \frac{x^n}{n}, \ |x| < 1$$

$$f(x) = \sum_{k=0}^{n} \frac{f^{(k)}(0)}{k!} x^k + r_n(x) \quad \text{where}$$

$$r_n(x) = \frac{1}{(n+1)!} f^{(n+1)}(t_x) x^{n+1}, \ 0 < t_x < x$$

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1. The interval of convergence of $\displaystyle\sum_{n=1}^{\infty} \frac{3}{n}\left(\frac{x}{2}\right)^n$ is

A. $[-2, 2)$

B. $(-2, 2)$

C. $(-\frac{2}{3}, \frac{2}{3})$

D. $[-\frac{2}{3}, \frac{2}{3})$

E. $(-\infty, \infty)$

2. The radius of convergence of $\displaystyle\sum_{n=0}^{\infty} \frac{(n+1)!}{(2n)!}x^n$ is

A. 0

B. 1

C. 2

D. 4

E. ∞

3. $\displaystyle\int_0^1 \cos(\sqrt{x})dx =$

A. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!(n+1)} x^{n+1}$

B. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!} x^{2n+1}$

C. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!}$

D. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!(n+1)}$

E. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!}$

4. The third degree Taylor polynomial $p_3(x)$ of e^{1+x} is

A. $1+(1+x)+\dfrac{(1+x)^2}{2}+\dfrac{(1+x)^3}{6}$

B. $1+x+\dfrac{x^2}{2}+\dfrac{x^3}{6}$

C. $e+ex+\dfrac{e}{2}x^2+\dfrac{e}{6}x^3$

D. $1+x^e+\dfrac{x^{2e}}{2}+\dfrac{x^{3e}}{6}$

E. $1+x+x^2+x^3$

5. The Taylor series of $f(x) = (1+x^3)^{\frac{1}{2}}$ is

A. $1 + \frac{1}{2}x^3 - \frac{1}{8}x^6 + \ldots$

B. $1 + \frac{3}{2}x + \frac{3}{8}x^2 + \ldots$

C. $1 - \frac{3}{2}x^2 + \frac{3}{8}x^4 - \ldots$

D. $1 - \frac{1}{2}x^2 + \frac{1}{8}x^4 - \ldots$

E. $1 - \frac{1}{6}x^6 + \frac{5}{36}x^{12} - \ldots$

6. The remainder term $r_3(x)$ in Taylor's Formula

$$\ln(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} + r_3(x)$$

is given by

A. $\frac{-1}{4}x^4$

B. $\frac{-1}{4!}x^4$

C. $\frac{-1}{4!(1+x)^4}x^4$

D. $\frac{-1}{4(1+t_x)^4}x^4$ for some t_x with $0 < t_x < x$

E. $\frac{-1}{3!(1+t_x)^3}x^4$ for some t_x with $0 < t_x < x$

7. The circular arc described in the figure has parametric equations

A. $x = 1 + \cos t,\ y = \sin t,\ 0 \le t \le \pi$

B. $x = 1 - \cos t,\ y = \sin t,\ \pi \le t \le 2\pi$

C. $x = \cos t,\ y = 1 + \sin t,\ 0 \le t \le \pi$

D. $x = 1 + \sin t,\ y = \cos t,\ 0 \le t \le \pi$

E. $x = 1 + \sin t,\ y = \cos t,\ \pi \le t \le 2\pi$

8. The curve with parametric equations $x = e^t \cos t$ and $y = e^t \sin t$, $0 \le t \le \pi$, is revolved about the x axis to generate a surface. Its area is

A. $2\pi \int_0^\pi \sqrt{2} e^{2t} \sin t \, dt$

B. $2\pi \int_0^\pi \sqrt{2} e^{t} \cos t \, dt$

C. $2\pi \int_0^\pi e^{2t} \sin t \, dt$

D. $2\pi \int_0^\pi e^{t} \sin t \, dt$

E. $2\pi \int_0^\pi e^{2t} \cos t \, dt$

9. Write the polar equation $r = 4\sin\theta$ as an equation in Cartesian coordinates.

A. $x^2 + y^2 = 4$

B. $(x-2)^2 + y^2 = 4$

C. $x^2 + (y-2)^2 = 4$

D. $(x+2)^2 + y^2 = 4$

E. $x^2 + (y+2)^2 = 4$

10. Let P be the point with Cartesian coordinates $(-3, 3)$. A set of polar coordinates for P is given by $(r, \theta) =$

A. $(3, \frac{3\pi}{4})$

B. $(-3\sqrt{2}, \frac{3\pi}{4})$

C. $(-3, -\frac{\pi}{4})$

D. $(-3, \frac{3\pi}{4})$

E. $(-3\sqrt{2}, -\frac{\pi}{4})$

11. The graph of the polar equation $r\sin(\theta + \frac{\pi}{3}) = 1$ is given by

A.

B.

C.

D.

E.