

NAME \_\_\_\_\_

STUDENT ID \_\_\_\_\_

REC. INSTR. \_\_\_\_\_ REC. TIME. \_\_\_\_\_

INSTRUCTOR \_\_\_\_\_

## INSTRUCTIONS:

1. Make sure that you have all 7 test pages.
  2. Fill in the information requested above and on the answer sheet.
  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.
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**Some infinite series:**

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

$$\tan^{-1} x = \sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{2n+1}$$

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

1. For which  $x$  does the series  $\sum_{n=1}^{\infty} \frac{(-1)^n x^n}{n^2 3^{n+1}}$  converge?

- A.  $-\frac{1}{3} < x < \frac{1}{3}$
- B.  $\frac{1}{3} \leq x \leq \frac{1}{3}$
- C.  $-3 \leq x < 3$
- D.  $-3 < x \leq 3$
- E.  $-3 \leq x \leq 3$

2. If the power series of  $f(x)$  is  $\sum_{n=1}^{\infty} \frac{2^{n-1} x^n}{n+2}$ , what is  $f^{(4)}(0)$ ?

- A.  $\frac{2}{9}$
- B.  $\frac{4}{3}$
- C. 32
- D.  $\frac{1}{3}$
- E.  $\frac{16}{3}$

3. Find the first three nonzero terms for the power series of  $f(x) = \frac{x}{1+3x^2}$ .

- A.  $x - 3x^3 + 9x^5$
- B.  $2x + 9x^3 + 81x^5$
- C.  $\frac{1}{3}x - \frac{1}{9}x^2 - \frac{1}{27}x^3$
- D.  $\frac{1}{3}x - \frac{1}{9}x^3 + \frac{1}{27}x^5$
- E.  $1 - 3x^2 + 9x^4$

4. Find the first three terms of the power series for

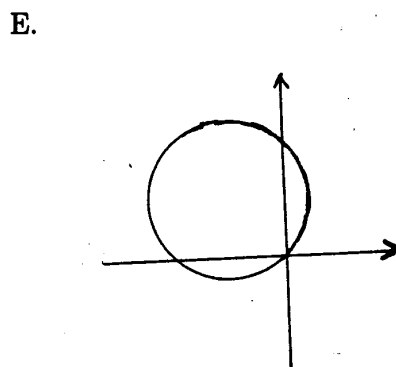
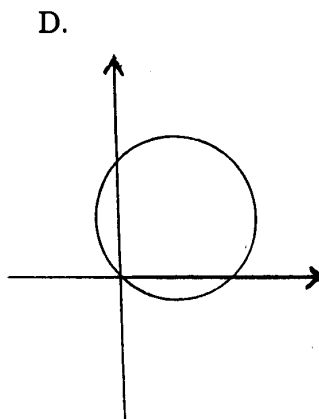
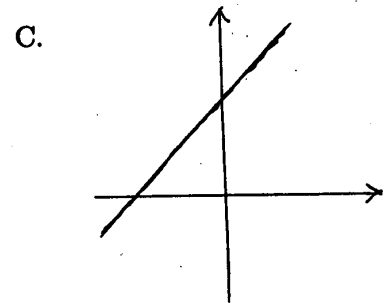
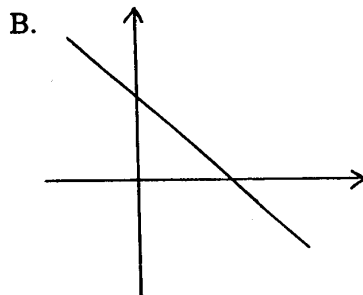
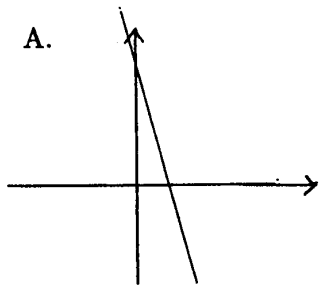
$$f(x) = \frac{1}{\sqrt{1+2x}}.$$

- A.  $1 - \frac{x}{2} + \frac{3x^2}{8}$
- B.  $1 + x - \frac{x^2}{2}$
- C.  $1 + \frac{x}{2} - \frac{x^2}{8}$
- D.  $1 - x + \frac{3x^2}{2}$
- E.  $1 - x - 3x^2$

5. Find the Taylor polynomial  $p_3(x)$  about  $a = 1$  for the function  $f(x) = x^4 - 3x^2 + x + 1$ .

- A.  $1 + (x - 1) - 2(x - 1)^2$
- B.  $-(x - 1) + 6(x - 1) + 24(x - 1)^3$
- C.  $1 + (x - 1) - 4(x - 1)^2$
- D.  $-(x - 1) + 3(x - 1)^2 + 4(x - 1)^3$
- E.  $-(x - 1) + 3(x - 1)^2 + 8(x - 1)^3$

6. Which of the curves below is described by the parameter equations  $x = 1 + 2t$ ,  $y = 2 - 2t$ .



7. An object is moving in the plane. If its position at time  $t$  is  $(1 - \cos^2 t, \sin 2t)$ , then its velocity when  $t = \frac{\pi}{4}$  is

A.  $\frac{\sqrt{5}}{2}$

B.  $\sqrt{\frac{3}{2}}$

C.  $\frac{1}{2}$

D.  $\frac{\sqrt{2}}{2}$

E. 1

8. The length of the curve  $x = \frac{t^3}{3} - t, y = t^2, 1 \leq t \leq 2$ , is

A.  $\frac{10}{3}$

B.  $\frac{14}{3}$

C.  $\frac{16}{5}$

D.  $\frac{19}{5}$

E. 4

9. If the polar coordinates of a point are  $\left(2, \frac{2\pi}{3}\right)$ , then its Cartesian coordinates are

A.  $(\sqrt{3}, 2\sqrt{3})$

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

C.  $(-1, \sqrt{3})$

D.  $\left(\frac{1}{2}, \frac{3}{2}\right)$

E.  $\left(1, -\frac{\sqrt{3}}{2}\right)$

10. If the polar equation of a curve is  $2r \cos \theta = \tan \theta$ , what is its Cartesian equation?

A.  $x^2 + y = 1$

B.  $2x^2y^2 = 1$

C.  $xy = y^2 + 1$

D.  $2x^2y = 1$

E.  $y = 2x^2$

11. The equation  $r = 3 + \sin \theta$  describes the curve

