
Name

Student ID number

Lecturer

Recitation Instructor

Time of Recitation Class

Instructions:

1. This package contains 14 problems, each worth 7 points, for a total of 100 points (that includes 2 bonus points for coming).
2. Please supply all information requested above and on the mark-sense sheet.
3. Work only in the space provided, or on the backside of the pages. Mark your answers clearly on the mark-sense sheet.
4. No books, notes, or calculator, please.

1. $\frac{d}{dx} \sin^{-1} \sqrt{x} =$

A. $\frac{\cos \sqrt{x}}{2\sqrt{x} \sin^2 \sqrt{x}}$

B. $\frac{\cos^{-1} \sqrt{x}}{2\sqrt{x}}$

C. $\frac{1}{2\sqrt{x - x^3}}$

D. $\frac{1}{\sqrt{1 - x}}$

E. $\frac{1}{2\sqrt{x - x^2}}$

2. An equation of the line tangent to the graph of $x^2 + y^4 = 2xy^2 + 1$ at $(2,1)$ is

A. $y = \frac{x}{2}$

B. $y = 2 - \frac{x}{2}$

C. $y = 2x - 3$

D. $y = 2x + 3$

E. None of the above

3. When $x = \frac{\pi}{3}$, $\frac{d^2}{dx^2} \cos 3x =$

- A. 6
- B. 9
- C. 12
- D. 0
- E. -6

4. If $y = \frac{e^x \sqrt{x}}{(x-1)^2}$, then $y' =$

- A. $\frac{e^x}{4\sqrt{x}(x-1)}$
- B. $\frac{\sqrt{x}}{(x-1)^4}$
- C. $1 + \frac{1}{2x} - \frac{2}{x-1}$
- D. $e^x \left(\frac{\sqrt{x}}{(x-1)^2} + \frac{1}{2\sqrt{x}} \right)$
- E. $\left(1 + \frac{1}{2x} - \frac{2}{x-1} \right) \frac{e^x \sqrt{x}}{(x-1)^2}$

5. $\lim_{x \rightarrow \infty} \sinh x =$

- A. $-\infty$
- B. -1
- C. 0
- D. 1
- E. ∞

6. The half-life of radioactive calcium-161 is 3 years. If a sample has a mass of 6 lb., how much will remain after 8 years?

- A. $\frac{6}{2^{8/3}}$ lb.
- B. 2 lb.
- C. $\frac{3}{2^{4/3}}$ lb.
- D. $\frac{6}{3^{1/4}}$ lb.
- E. $\frac{8}{3^3}$ lb.

7. A particle moves along the curve $y = (5 + x^2)^{3/2}$. As it reaches the point (2,27) the x -coordinate is increasing at a rate of 2 in/s. How fast (in in/s) is the y -coordinate of the point increasing at that instant?

- A. 4
- B. 9
- C. 18
- D. 36
- E. 54

8. Use differentials (or equivalently, a linear approximation) to estimate $\sqrt[4]{80}$.

- A. $3 - \frac{1}{4} \cdot \frac{1}{27}$
- B. $3 + \frac{1}{4} \cdot \frac{1}{27}$
- C. $3 - \frac{1}{4} \cdot \frac{1}{3}$
- D. $3 + \frac{1}{4} \cdot \frac{1}{3}$
- E. $4 - \frac{1}{4} \cdot \frac{1}{3}$

9. A spotlight on the ground shines on a vertical wall 12 m away. If a man 2 m tall walks from the spotlight toward the wall at a rate of 2 m/s, how fast is the length of his shadow on the wall decreasing when he is 5 m from it?

- A. 2 m/s
- B. $\frac{48}{49}$ m/s
- C. $\frac{24}{5}$ m/s
- D. $\frac{24}{10}$ m/s
- E. $\frac{48}{25}$ m/s

10. A circle has a circumference measured to be 30 in with a possible error of $\frac{1}{4}$ in. Estimate the maximum error in the resulting area of the circle (in in²).

- A. 30
- B. 30π
- C. $\frac{30}{\pi}$
- D. $\frac{15}{4\pi}$
- E. $\frac{15}{2\pi}$

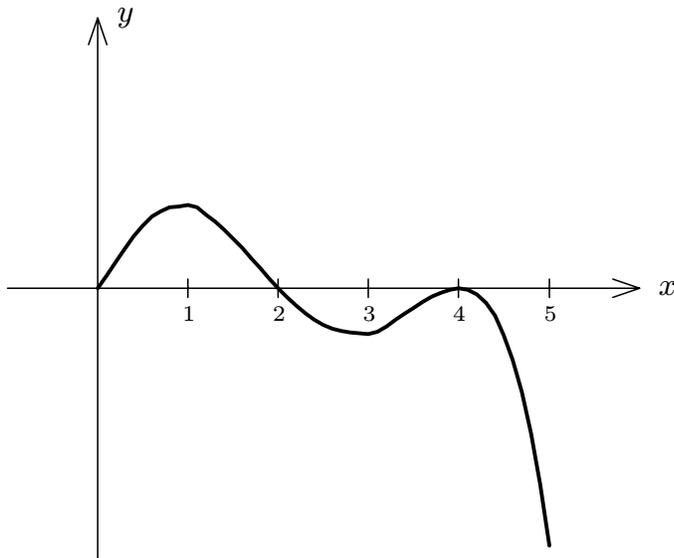
11. The absolute minimum value of the function $f(x) = x^2 + 2/x$ on the interval $[\frac{1}{2}, \frac{3}{2}]$ is

- A. $\frac{9}{4}$
- B. $\frac{17}{4}$
- C. 3
- D. $\frac{41}{12}$
- E. $\frac{35}{12}$

12. The function $f(x) = x^4 - 8x^2$ satisfies the three hypotheses of the Rolle's Theorem on the interval $[-1, 1]$. How many numbers c are there that satisfy the conclusion of the Rolle's Theorem?

- A. 0
- B. 1
- C. 2
- D. 3
- E. None of the above

13. Given the graph of $y = f'(x)$ below, it follows that



- A. f is decreasing on $(1,3)$
- B. f is concave upward on $(2,4)$
- C. f is increasing on $(1,2)$
- D. f is concave downward on $(0,2)$
- E. None of the above

14. The function $f(x) = x^4(x - 1)^3$ has

- A. two critical numbers
- B. a relative minimum at $x = 0$
- C. a relative minimum at $x = 1$
- D. a relative maximum at $x = 1$
- E. None of the above