

Final Exam

Math 1305-Cox
July 20, 2012

Name: _____

Show all appropriate work. You may omit one problems by writing OMIT in the answer blank. All problems are weighted equally.

For problems 1-5, find the derivative $\frac{dy}{dx}$. Simplify as appropriate.

1. $y=3x^4+12x^3+36x^2+72x+72$

ANSWER: _____

2. $y=x^2\sin(x)$

ANSWER: _____

3. $y=\cos(x^2)$

ANSWER: _____

4. $y=x^{\cos(x)}$

ANSWER: _____

5. $x^2+xy+y^2=9.$

ANSWER: _____

In problems 6-13, evaluate the given definite or indefinite integral.

6. $\int \sec(x) \tan(x) dx$

ANSWER: _____

7. $\int_1^2 \frac{1}{x^3} dx$

ANSWER: _____

8. $\int_0^2 e^{3x} dx$

ANSWER: _____

9. $\int \frac{1}{1+x^2} dx$

ANSWER: _____

$$10. \int x\sqrt{x^2+1}dx$$

ANSWER: _____

$$11. \int \frac{(\ln x)^5}{x} dx$$

ANSWER: _____

$$12. \int \frac{x^3+9}{\sqrt{x}} dx$$

ANSWER: _____

$$13. \int x\sqrt{x+3}dx$$

ANSWER: _____

Evaluate the given limits in problems 13-16 by any appropriate method.

14. $\lim_{x \rightarrow 5} \frac{x - 5}{x^2 + 2x - 35}$

ANSWER: _____

15. $\lim_{x \rightarrow 0} \frac{x + 1 - \cos x}{e^x + \sin x - 1}$

ANSWER: _____

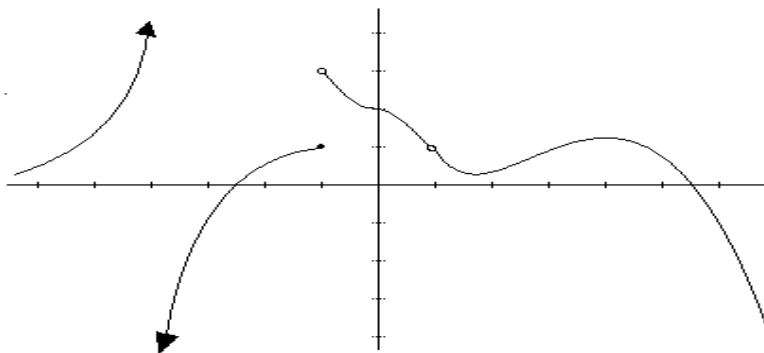
16. $\lim_{x \rightarrow 0} x \ln x$

ANSWER: _____

17. $\lim_{x \rightarrow \infty} \frac{\sqrt{25x^6 - 6x^2}}{50x^3 + 1000x^2}$

ANSWER: _____

18. Below is given a graph of a function $y=f(x)$. For what values is the function discontinuous? (Each tick mark is one unit.)



Discontinuities: _____

19. Use Newton's method with an initial guess $x_0=1.5$ and three iterations to solve the equation $\sin(x)=x^2$. Fill in the values on the table and show your work to the right.

n	x_n
0	1.5
1	
2	
3	

20. Find the equation for the line tangent to $y=x^3-3x$ when $x=1$. Write your answer in slope-intercept form.

Equation: _____

21. A cylindrical can is designed to have a volume of 100 cubic centimeters. What should the radius be in order to minimize the surface area of the can?

Radius: _____

22. Find all critical numbers for the function $f(x)=x+\frac{9}{x}$ and use an appropriate test to classify each as a relative minimum, relative maximum, or neither.

ANSWER(s): _____

23. Find the global (absolute) maximum and minimum values of $f(x)=2x^3+3x^2-72x+1$ on the interval $[0,5]$.

ANSWER(s): _____

24. A 50 ft long ladder is leaning up against a wall when the top of the ladder begins sliding down the wall while the bottom slides away from the wall on the ground. When the bottom is forty feet away from the wall it is moving at five feet per second. How fast is the top sliding down the wall?

Answer: _____

25. Find the linear approximation $L(x)$ for $f(x) = \sqrt{x}$ and use it to approximate $\sqrt{99}$.

$L(x) =$ _____ $\sqrt{99} \approx$ _____

26. Use the left endpoint method with four subintervals ($n=4$) to approximate the area under the curve $y=2+x^2$ above the interval $[0,2]$. Sketch the graph with the rectangles and state whether you are using left endpoints, right endpoints, or another option for your area approximation. After you are done calculate the exact answer to check your approximation.

Approximate area: _____ Actual area: _____