

Name: _____

EMPLID: _____

1. (5 points) Find $\frac{dy}{dx}$ when $y = \sqrt{x^4 + 1}$. Simplify your answer.

1. _____

2. (5 points) Find the derivative of $y = t \ln(2t)$. Simplify your answer.

2. _____

3. (5 points) Find the derivative of $f(x) = \sin(\frac{2}{x})$. Simplify your answer.

3. _____

4. (5 points) Find the $\frac{dy}{dt}$ when $y = e^{2t} - \tan 2t$. Simplify your answer.

4. _____

5. (5 points) Evaluate $\int x^3 \sqrt{2x^4 + 1} \, dx$

5. _____

6. (5 points) Evaluate $\int \frac{x}{x^2+1} \, dx$

6. _____

7. (5 points) Evaluate $\int_0^\pi 3 \cos^2 t \sin t \, dt$

7. _____

8. (5 points) Evaluate $\int_1^9 \frac{\sqrt{u}-2u^2}{u} \, du$

8. _____

9. (5 points) Find $\frac{dy}{dx}$ when $x^5 + x^2y^3 + y^2 = 10$.

9. _____

10. Let $f(x) = 1 - x^2$.

(a) (5 points) Find $f'(x)$ using definition of the derivative. No credit will be given for using any other method.

(b) (5 points) Find an equation of the tangent line to the graph of f when $x = 2$.

(b) _____

11. (5 points) Find the area of the region enclosed by the parabola $y = 2 - x^2$ and the line $y = -x$. Make a rough sketch of the region.

11. _____

12. (5 points) Sketch the graph of $f(x) = \frac{(x+1)^2}{1+x^2}$. Indicate all asymptotes, maximum, minimum, and inflection points, if any. HINT: $f'(x) = \frac{2(1-x^2)}{(1+x^2)^2}$, $f''(x) = \frac{4x(x^2-3)}{(1+x^2)^3}$.

13. (5 points) Sketch the graph of $y = 4x^3 - x^4$. Indicate all asymptotes, maximum, minimum, and inflection points, if any.

14. (5 points) Find $\lim_{x \rightarrow 0} \frac{\sqrt{x^2+100}-10}{x^2}$

14. _____

15. (5 points) Use linear approximation or differentials to estimate $\sqrt{4.01}$. No credit will be given for any other method.

15. _____

16. (5 points) Evaluate $\lim_{x \rightarrow 0^-} \frac{3x}{|x|}$.

16. _____

17. (5 points) Find the absolute maximum and the absolute minimum values of $f(t) = 10x(2 - \ln x)$ on the interval $[1, e^2]$.

17. _____

18. (5 points) An open-top box is to be made by cutting small congruent squares from the corners of a 12 in. by 12 in. sheet of tin and bending up the sides. Find the largest volume inside of such a box.

18. _____

19. (5 points) Find $\frac{dy}{dx}$ when $y = \int_2^{x^3} \cos(t^2) dt$

19. _____

20. (5 points) Use Riemann sums to approximate $\int_0^2 (4 - x^2) dx$, with four subintervals, taking sample points to be left endpoints. Illustrate with a graph.

20. _____

21. (5 points) The radius r of a circle is changing at the rate of $-\frac{2}{\pi}$ m/sec. At what rate is the circle's area changing when $r = 10$ m?

21. _____