

MA161 - Exam 2 - Guide
October 14, 2024
Show your work!

Name: _____

Find $f'(x)$.

1. $f(x) = \ln 4 + e^4$

2. $f(x) = -\pi x$

3. $f(x) = 4e^{-x} + \tan x + 16 \ln x$

4. $f(x) = (4x^7 - 5e^{4x} + \cos x)^8$

5. $f(x) = (\ln x)^6$

6. $f(x) = \frac{x + 3x^2 + 4\sqrt{x}}{\sqrt{x}}$

Hint: Algebra first.

7. $f(x) = x^6 \sec x$

8. $f(x) = 6^{\ln x}$

9. $f(x) = e^{\cos^2 x}$

10. $f(x) = \ln(\cos^2 x)$

11. $f(x) = x^5 \sin^{-1} x$

12. $f(x) = \cos^{-1}(x^4)$

At a time t seconds after it is thrown up in the air, a tomato is at a height (in meters) of

$$f(t) = -4.9t^2 + 55t + 1m.$$

(a) Find the instantaneous velocity of the tomato at time $t = 1$ (include units!)

(b) Is the tomato going up or coming down at time $t = 4$? (justify your answer)

(c) How high does the tomato go?

13. $f(x) = \sqrt{x^2 - 1}$

14. $f(x) = \ln(\ln x)$

15. $f(x) = \frac{1 - e^x}{1 + e^x}$

16. $f(x) = \frac{1}{\sin(2x)}$

17. $f(x) = x^{7x}$

18. A boat leaves Marquette at 3:00 PM and travels due north at a speed of 10 m/h. Another boat has been heading west at 15 m/h and reaches Marquette at 5:00 PM. At what time were the boats closest together?
19. Find all points (x, y) where the curve $(x - 1)^2 + (y - 1)^2 = 1$ has a horizontal tangent.
20. There are two tangent lines to the curve $x^2 + xy = 1$ that have slope equal to -2. Find equations for them.
21. Find the equation of the tangent line to the graph of $y = (x^2 + 1)\sin x$ at $x = 0$. Use the linearization to approximate $(1.05)^{10}$ by
22. Suppose the volume of a spherical balloon increases at a rate of $24 \frac{cm^3}{sec}$. Find the rate that its diameter is increasing when the diameter is $3cm$.
23. Find the absolute maximum and absolute minimum of the function on the indicated interval.

$$f(x) = \frac{x^4}{4} - 2x^2 + 1, \quad [-3, 1]$$