

NAME:

Math 150 Practice Exam 2.1

Instructions: WRITE YOUR NAME CLEARLY. Do as many problems as you can for a maximal score of 100. SHOW YOUR WORK!

1. Compute $\frac{dy}{dx}$ where $y = (\sin^2 x + 1)^4$ [10 pts]

2. Compute $\frac{dy}{dx}$ where $y = \left(\frac{x-1}{x+1}\right)^8$ [10 pts]

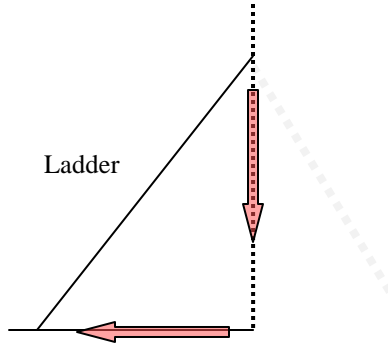
3. Calculate $\frac{dy}{dx}$ implicitly from the equation $\sin xy = x + y$ [10 pts]

4. Find an equation of the tangent line to the curve $x^4 + y^4 = 2$ at the point $(1, -1)$ [10 pts]

5. Calculate $\frac{dy}{dx}$ implicitly from the equation $\sqrt{x^4 + y^2} = 5x + 2y^3$ [10 pts]

6. A bug is moving along the parabola $y = x^2$. At what point on the parabola are the x - and y -coordinates changing at the same rate? [10 pts]

7. A 13-foot ladder is leaning against a vertical wall when Jack begins pulling the foot of the ladder away from the wall at a rate of 0.5 ft/s. How fast is the top of the ladder sliding down the wall when the foot of the ladder is 5 ft from the wall? [10 pts]



8. What two positive real numbers whose product is 50 have the smallest possible sum? [10 pts]
9. Let $f(x) = \sqrt{x}$. Find all numbers c that satisfy the statement of the Mean Value Theorem in the interval $[1, 4]$. Be sure to explain why the Mean Value Theorem applies to the given function. [10 pts]

10. A state patrol officer saw a car start from rest at a highway on-ramp. She radioed ahead to a patrol officer 30 mi along the highway. When the car reached the location of the second officer 28 min later, it was clocked going 60 mi/hr. The driver of the car was given a ticket for exceeding the 60 mi/hr speed limit. Why can the officer conclude that the driver exceeded the speed limit? [10 pts]

Extra-Credit

11. State and prove the Mean Value Theorem. [10 pts]

12. Prove that if $f'(x) = 0$ for all $x \in (a, b)$, then $f(x) = C$ for some constant C . [10 pts]