

Practice Test 2

1. Find the second derivative:

a. $f(x) = x\sqrt{3x - 5}$

b. $f(x) = (x^2 - 3x)^3$

2. Find the third derivative of

$$f(x) = \sqrt{2x + 3}.$$

3. Find $\frac{dy}{dx}$ by implicit differentiation if $\sqrt{xy} = x + y$.

4. A 13 foot ladder is leaning against a wall. If the bottom of the ladder is pulled away from the wall at a rate of 2.5 ft/sec, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 12 feet from the wall?

5. Find the relative extrema of

$$f(x) = 2x^2 + \frac{4000}{x} + 10.$$

6. Graph the following function, using information such as intervals of increase and decrease, relative extrema, intervals of upward and downward concavity, and inflection points:

$$g(x) = 3x^4 + 4x^3.$$

7. Find the absolute extrema, if they exist, for

$$h(x) = 3x^{\frac{2}{3}} - 2x$$

on the interval $[0, 3]$.

8. You are constructing a closed rectangular box with a volume of 4 cubic feet. The length of the base of the box will be twice as long as its width. The material for the top and bottom of the box costs 30 cents per square foot. The material for the sides of the box costs 20 cents per square foot. Find the dimensions of the least expensive box that can be constructed.

9. Simplify:

a. $\left(x^{\frac{3}{2}}\right)^{-\frac{r}{3}}$

b. $\left(\frac{9}{25}\right)^{-\frac{1}{2}}\left(\frac{1}{27}\right)^{-\frac{2}{3}}$

10. Write as a sum and/or difference of logarithms:

$$\log_5\left(\frac{x^2\sqrt{y-1}}{(z-3)^2\sqrt[5]{w+8}}\right).$$

11. Solve:

a. $3^{3x-4} = 243$

b. $5e^{-2t} - 2 = 4$