

Review Problems for Exam 2
MATH 1850, Spring 2013

1. Find an equation for the tangent to the curve at the given point. Then sketch the curve and the tangent together.

$$y = 8\sqrt{x}, \quad (1, 8)$$

2. Find the point (x, y) at which the graph of $y = 3x^2 + 8x - 6$ has a horizontal tangent.
3. Find the equations of all lines having slope -3 that are tangent to the curve $y = \frac{12}{x+1}$.

4. Use the formula $f'(x) = \frac{f(z) - f(x)}{z - x}$ to find the derivative of the following function.

$$f(x) = \frac{5}{x+10}$$

5. Determine if the following piecewise defined function is differentiable at $x = 0$.

$$f(x) = \begin{cases} 4x - 1, & x \geq 0 \\ x^2 + 3x - 1, & x < 0 \end{cases}$$

What is the right-hand derivative of the given function, $\lim_{h \rightarrow 0^+} \frac{f(0+h) - f(0)}{h}$?

6. Using the definition, calculate the derivative of the function. Then find the value of the derivative as specified.

$$g(t) = \frac{5}{t^2}, \quad g'(-2), g'(3), g'(\sqrt{2})$$

7. Find the first and the second derivatives.

$$r = \frac{1}{3s^2} - \frac{7}{4s^3}$$

8. Find the derivative of the function.

$$f(s) = \frac{\sqrt{s} - 3}{\sqrt{s} + 1}$$

9. Find all points (x, y) on the graph of $y = \frac{x}{x-1}$ with tangent lines perpendicular to the line $y = x + 3$.

10. An object is dropped from a tower, 175 ft from the ground. The object's height above ground t sec into the fall is $s = 175 - 16t^2$.
- What is the object's velocity, speed, and acceleration at time t ?
 - About how long does it take the object to hit the ground?
 - What is the object's velocity at the moment of impact?
11. A body moves on a coordinate line such that it has a position $s = f(t) = t^2 - 4t + 3$ on the interval $0 \leq t \leq 5$, with s in meters and t in seconds.
- Find the body's displacement and average velocity for the given time interval.
 - Find the body's speed and acceleration at the endpoints of the interval.
 - When, if ever, during the interval does the body change direction?
12. Find $\frac{dy}{dx}$ for $y = 9x^2 \sin x + 18x \cos x - 18 \sin x$.
13. Find $\frac{dp}{dq}$ for $p = \frac{\sin q + \cos q}{\cos q}$.
14. Find $\frac{dr}{d\theta}$ for $r = 2 - \theta^5 \sin \theta$.
15. Write the function in the form $y = f(u)$ and $u = g(x)$. Then find $\frac{dy}{dx}$ as a function of x .

$$y = \left(1 - \frac{3x}{4}\right)^{-4}$$

16. Find the derivative of the function below.

$$h(x) = x \cot(2\sqrt{x}) + 19$$

17. Find $\frac{dy}{dt}$.

$$y = (3 + \cos 4t)^{-5}$$

18. Find $\frac{dy}{dt}$.

$$y = \cot^2(\cos^3 t)$$

19. Find the derivative of the given function.

$$y = (x^2 - 5x + 5)e^{6x/5}$$

20. Use implicit differentiation to find $\frac{dy}{dx}$.

$$(6xy + 5)^2 = 12y$$

21. Use implicit differentiation to find $\frac{dy}{dx}$.

$$x \cos(2x + 7y) = y \sin x$$

22. Find the slope of the tangent and normal line to the curve at the given point.

$$x^2y^2 + y = 34, \quad (3, -2)$$

23. Let $f(x) = 4x^3 - 7x^2 - 2$, $x \geq 1.5$. Find the value of $\frac{df^{-1}}{dx}$ at the point $x = 323 = f(5)$.

24. Find the derivative of y with respect to x .

$$y = \frac{\ln x}{5 + 3 \ln x}$$

25. Find the derivative of y with respect to x .

$$y = (\sin 2x)^{3x}$$