

## Answers to Review Problems for the Second Midterm

### Math 3A, Fall 2005

1. If  $f(x) = x^4$ ,

$$f'(3) = \lim_{h \rightarrow 0} \frac{(3+h)^4 - 81}{h} = 4(3)^3 = 108$$

2. (a)  $y = 2x - 2 \ln 2 + 2$

(b)  $y = ex$

3. (a)  $f'(x) = -\frac{1}{x^2} - \frac{5}{6\sqrt[6]{x}}$

(b)  $y' = 2x \arctan x + 1$

(c)  $s'(t) = -\frac{\sin \sqrt{t}}{4\sqrt{t}\sqrt{\cos \sqrt{t}}}$

(d)  $f'(x) = \frac{2}{\ln a} \frac{1}{x}$

(e)  $y' = \frac{2 - 2 \ln x}{x^2}$

4. (a)  $y' = \frac{(12x - 2)(3x^2 + 3y^2 - x) - 2x}{2y - 12y(3x^2 + 3y^2 - x)}$

(b)  $y = -x - \frac{1}{3}$

$$(c) y'' = \frac{(12(3x^2 + 3y^2 - x) + (12x - 2)(6x + 6y(y') - 1) - 2)(2y - 12y(3x^2 + 3y^2 - x))}{(2y - 12y(3x^2 + 3y^2 - x))^2} - \frac{((12x - 2)(3x^2 + 3y^2 - x) - 2x)((y')(2 - 12(3x^2 + 3y^2 - x)) + 12y(6x + 6y(y') - 1))}{(2y - 12y(3x^2 + 3y^2 - x))^2}$$

plus, plug  $y'$  from part (a) into this answer the three places it appears...

5. (a)  $y' = \left( \frac{x^{\frac{3}{4}} \tan(3x)}{(x+2)^5 \ln x} \right) \left( \frac{3}{4x} + \frac{3 \sec^2(3x)}{\tan(3x)} - \frac{5}{x+2} - \frac{1}{x \ln x} \right)$

(b)  $y' = x^{\sin(e^x)} \left( e^x \cos e^x \ln x + \frac{\sin e^x}{x} \right)$

6. (a)  $v(t) = 6t^2 - 14t + 4$ ,  $a(t) = 12t - 14$   
(b) Up when  $0 < t < \frac{1}{3}$  and  $t > 2$ ; down when  $\frac{1}{3} < t < 2$   
(c) 10  
(d) speeding up when  $t > \frac{7}{6}$ ; slowing down when  $0 < t < \frac{7}{6}$

7.  $\frac{dh}{dt} = \frac{8}{9\pi}$  cm/s

8. 13 ft/s