

9. a)  $2x+1$  b)  $1 - \frac{1}{2\sqrt{x}}$   
 c)  $\sin x + x \cos x$  d)  $e^x(1+x)$   
 e)  $e^x(2ux + \frac{1}{x})$

10. a)  $4(2x-1)$  b)  $2(x-\sqrt{x})(1-\frac{1}{2\sqrt{x}})$   
 c)  $100(x^2+x+1)^{99}(2x+1)$   
 d)  $3\sin^2 x \cos x$  e)  $\frac{5e^{4x}}{x}$

11. a)  $\frac{x(x-2)}{(x-1)^2}$  b)  $\frac{4x}{(x^2+1)^2}$   
 c)  $\frac{1}{\cos^2 x}$  d)  $\frac{\cos x - \sin x}{e^x}$   
 e)  $\frac{2ux-2}{2\sqrt{x} e^{u^2 x}}$  f)  $\frac{\sin x - x \cos x}{x \sin^2 x}$

12. a)  $10(2x+1)^4$   
 b)  $\frac{x}{\sqrt{x^2+1}}$   
 13. a)  $4x[3(x^2-1)^2+1][(x^2-1)^3+x^2]$   
 b)  $\frac{(1+x)(3-x)}{(1-x)^2}$   
 c)  $\frac{2\sqrt{x}+1}{4\sqrt{x}\sqrt{x+\sqrt{x}}}$

14. a)  $10(1+x+x^2)^9(1+2x)$   
 b)  $\frac{x-1}{\sqrt{x^2-2x}}$  c)  $\frac{\cos \sqrt{x}}{2\sqrt{x}}$   
 d)  $\frac{-\sin x}{2\sqrt{\cos x}}$  e)  $\frac{1}{2x}$   
 f)  $\frac{1+e^x}{2\sqrt{x+e^x}}$

15. a)  $y' = -3+8x$ ;  $y'' = 8$   
 b)  $y' = -2+2x-6x^2$ ;  $y'' = 2-12x$   
 c)  $y' = -1/x^2$ ;  $y'' = 2/x^3$   
 d)  $y' = -2/x^3$ ;  $y'' = 6/x^4$   
 e)  $y' = 1/(2\sqrt{x})$ ;  $y'' = -1/(4x\sqrt{x})$   
 f)  $y' = (x+1)^{-2}$ ;  $y'' = -2(x+1)^{-3}$   
 g)  $y' = \cos x$ ;  $y'' = -\sin x$   
 h)  $y' = e^x$ ;  $y'' = e^x$

16. a)  $v(t) = 4t-3$ ;  $a(t) = 4$   
 b)  $v(t) = 3t^2+4t+1$ ;  $a(t) = 6t+4$   
 c)  $v(t) = (t+1)^{-2}$ ;  $a(t) = -2(t+1)^{-3}$

17. a)  $t = \pm \frac{1}{\sqrt{3}}$

9. Differentiate.  
 a)  $f(x) = (x-1)(x+2)$  b)  $f(x) = \sqrt{x}(\sqrt{x}-1)$   
 c)  $x \sin x$  d)  $xe^x$  e)  $e^x \ln x$

10. Differentiate.  
 a)  $f(x) = (2x-1)^2$  b)  $f(x) = (x-\sqrt{x})^2$   
 c)  $f(x) = (x^2+x+1)^{100}$   
 d)  $f(x) = \sin^3 x$  e)  $f(x) = (\ln x)^5$

11. Differentiate, then simplify.  
 a)  $f(x) = \frac{x^2}{x-1}$  b)  $f(x) = \frac{x^2-1}{x^2+1}$   
 c)  $f(x) = \frac{\sin x}{\cos x}$  d)  $f(x) = \frac{\sin x}{e^x}$   
 e)  $f(x) = \frac{\sqrt{x}}{\ln x}$  f)  $f(x) = \frac{\ln x}{\sin x}$

12. For each case, use  $\frac{dy}{dx} = \frac{dy}{du} \frac{du}{dx}$  to find the derivative of  $y = f(g(x))$ .  
 a)  $y = u^5$ ,  $u = 2x-1$  b)  $y = \sqrt{u}$ ,  $u = x^2+1$

13. Use chain rule to differentiate.  
 a)  $y = [(x^2-1)^3+x^2]^2$  b)  $y = \frac{(1-x^2)^2}{(1-x)^3}$   
 c)  $y = \sqrt{x+\sqrt{x}}$

14. Use the generalized differentiation rules to find the derivative of each function.  
 a)  $y = (1+x+x^2)^{10}$  b)  $y = \sqrt{x^2-2x}$   
 c)  $y = \sin \sqrt{x}$  d)  $y = \sqrt{\cos x}$   
 e)  $y = \ln \sqrt{x}$  f)  $y = \sqrt{x+e^x}$

15. For each case, find the second and third derivative.  
 a)  $y = 1-3x+4x^2$  b)  $y = 4-2x+x^2-2x^3$   
 c)  $y = \frac{1}{x}$  d)  $y = \frac{1}{x^2}$   
 e)  $y = \sqrt{x}$  f)  $y = \frac{x}{x+1}$   
 g)  $y = \sin x$  h)  $y = e^x$   
 i)  $y = \ln x$  j)  $y = \log x$   
 $y' = \frac{1}{x}$ ;  $y'' = -\frac{1}{x^2}$   $y' = \frac{1}{(x+1)^2}$ ;  $y'' = -\frac{2}{(x+1)^3}$

16. For each case, find the velocity and the acceleration functions.  
 a)  $s(t) = 2t^2-3t+1$  b)  $s(t) = t^3+2t^2+t-3$   
 c)  $s(t) = \frac{t}{t+1}$

17. For each case, find the moments of time at which the object is at rest.