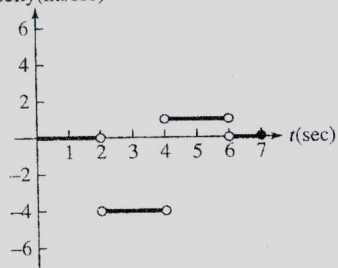
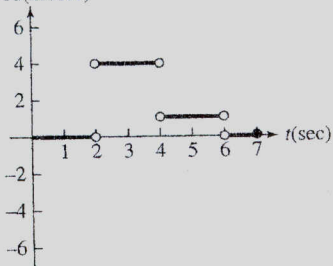


**Section 3.4**

1. (a)  $2 < t < 4$   
 (b)  $4 < t < 6$   
 (c)  $0 \leq t < 2, 6 < t \leq 7$   
 (d) Velocity(in./sec)

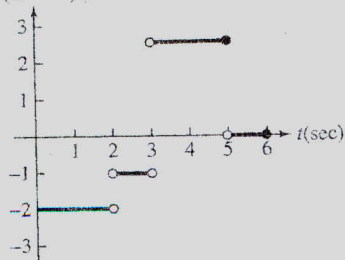


Speed(in./sec)



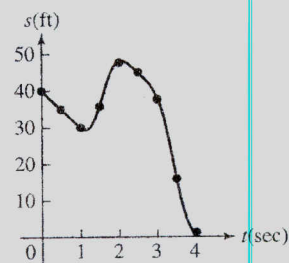
(e)  $2 < t < 4$

2. (a) At  $t = 1$  sec and at  $t \approx 4.25$  sec  
 (b)  $5 < t \leq 6$  (c)  $t = 3$  sec  
 (d)  $a(\text{m/sec}^2)$



3. (a) 12 cm (b) 2 cm/sec  
 (c)  $v(t) = t^2 - 6t + 8; a(t) = 2t - 6$   
 (d)  $2 < t < 4$

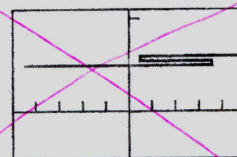
4. (a)



- (b)  $-10$  ft/sec;  $-10$  ft/sec;  $-29$  ft/sec  
 (c)  $t \approx 1$  sec,  $t \approx 2$  sec  
 (d)  $t \approx 3.5$  sec

5. (a)  $t = 3, x = 36; t = 7, x = 4$

(b)



$[-50, 50]$  by  $[-1, 2.1]$

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# Derivatives Lab

5.  $y' = -3\sin x$

$$y'(\pi/4) = -3\left(\frac{\sqrt{2}}{2}\right) = \frac{-3\sqrt{2}}{2}$$

$$y(\pi/4) = \frac{3\sqrt{2}}{2}$$

$$y - \frac{3\sqrt{2}}{2} = \frac{-3\sqrt{2}}{2} (x - \pi/4)$$

6.  $\frac{(x-1) - (x+1)}{(x-1)^2} = \frac{-2}{(x-1)^2} = f'(x)$

$$y = -2x + 1$$

$$\frac{-2}{(x-1)^2} = -2$$

$$-2 = -2(x-1)^2$$

$$1 = (x-1)^2$$

$$x-1 = \pm 1$$

$$x = 2, 0$$

$$(2, 3) \quad (0, -1)$$

5. a)  $v(t) = 520 - 32t$  if moving upward when  $v(t) > 0$

$$520 - 32t > 0$$

$$t < 16.25 \text{ secs}$$

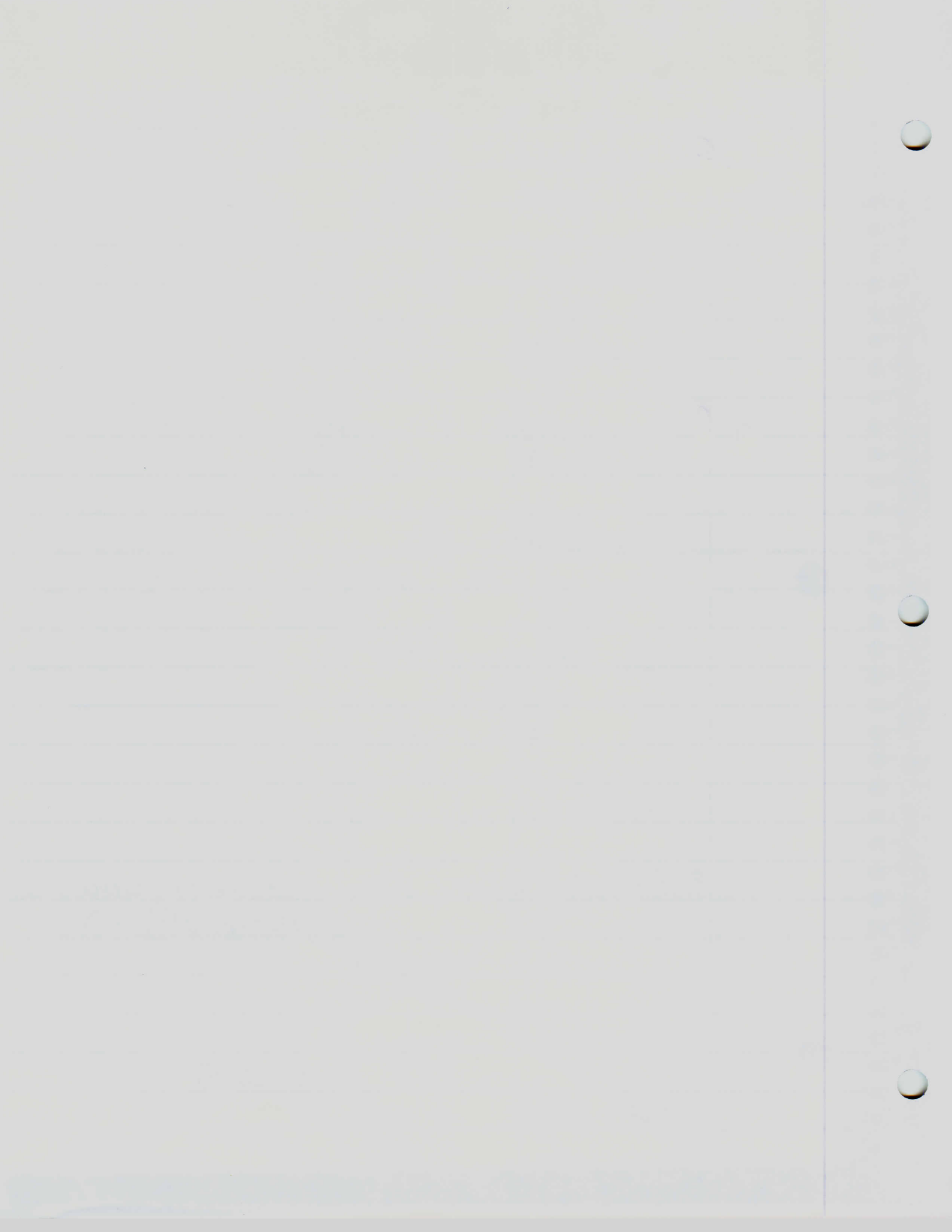
b)  $h(t) = 520t - 16t^2 = 0$

$$t = 0 \text{ or } t = 32.5$$

$$v(32.5) = -520$$

$$a(t) = -32$$

$$a(32.5) = -32$$



6.  $x=0$  No Function is not continuous  
 $x=4$  No There is a corner  
 $x=12$  Yes the function is continuous  
 and smooth

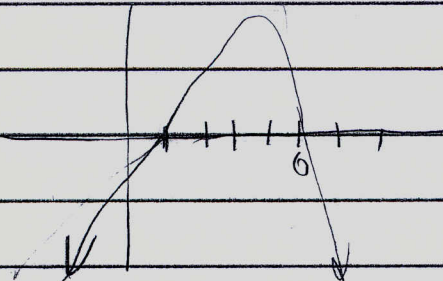
8. 
$$\lim_{h \rightarrow 0} \frac{2}{x+h} - \frac{2}{x}$$

$$\frac{2x - 2(x+h)}{h \cdot x(x+h)}$$

$$\frac{2x - 2x - 2h}{h(x+h)x} = \frac{-2h}{hx(x+h)}$$

$$\lim_{h \rightarrow 0} \frac{-2}{x(x+h)} = \frac{-2}{x^2}$$

8.



9.



$$19. y' = \frac{2 \ln(x+4)}{(x+4)}$$

$$2 \ln(x+4) = 0$$

Horizontal tangent

$$\ln(x+4) = 0$$

$$e^0 = x+4$$

$$1 = x+4$$

$$x = -3$$

$$x+4 = 0$$

Vertical tangent

$$x = -4$$

$$20. y' = e^x$$

$$y = \frac{1}{4}x - \frac{1}{4}$$

$$m = \frac{1}{4}$$

$$e^x = \frac{1}{4}$$

$$x \ln e^x = \ln \frac{1}{4}$$

$$x \ln e = \ln \frac{1}{4}$$

$$x = \ln \frac{1}{4}$$

$$y = e^{\ln(\frac{1}{4})} = \frac{1}{4}$$

$$y - \frac{1}{4} = \frac{1}{4}(x - \ln \frac{1}{4})$$

$$21. \frac{h(3) - h(1)}{3-1} = \frac{6-134}{2} = -64$$

$$v(t) = -32t$$

$$v(1) = -32$$

$$v(3) = -96$$





$$13 \text{ 10. } R'(x) = \begin{cases} 2ax \\ b \end{cases}$$

$$2ax = b \quad x = 1000$$

$$2000a = b$$

~~$$\lim_{x \geq 1000} ax^2 = \lim_{x \geq 1000} bx + c$$

$$(1000)^2 a = 1000b + c$$

$$100 = a(1000)^2$$~~

$$a = 10^{-4}$$

$$2000(10^{-4}) = b$$

$$\boxed{b = .2}$$

$$14 \text{ 8. a) } 12x^5 - 12x^3 + 20x$$

$$b) f(x) = (2x-2)^{1/3}$$

$$f'(x) = \frac{1}{3}(2x-2)^{-2/3} \cdot 2$$

$$f(x) = \frac{2}{3} \sqrt[3]{(2x-2)^2} = \cos(2x)$$

$$c) f'(x) = -2\sin(2x)$$

$$f''(x) = -4\cos(2x)$$

$$f^3(x) = 8\sin(2x)$$

$$f^4(x) = -16\cos(2x)$$

$$f^5(x) = 32\sin(2x)$$

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$$d. f'(x) = 2e^{2x}$$

$$f''(x) = 4e^{2x}$$

$$f'''(x) = 8e^{2x}$$

$$e) \frac{-(1+\tan x)\sin x - \cos x \sec^2 x}{(1+\tan x)^2}$$

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

$$f'(x) = \frac{2 \cdot \cos(x+2) \cdot 1}{2\sqrt{\sin(x+2)}}$$

$$\frac{\cos(x+2)}{\sqrt{\sin(x+2)}}$$

$$\frac{\cos(x+2)}{\sqrt{\sin(x+2)}}$$

$$\frac{\cos(x+2)}{\sqrt{\sin(x+2)}}$$

$$g) f(x) = 2e^{-(2x^2+3x+1)}$$

$$-2(2x+3)e^{-(2x^2+3x+1)}$$

$$h) e^x(-3x^2+3) + e^x(-x^3+3x)$$

$$e^x(-3x^2+3-x^3+3x)$$

$$e^x(-x^3-3x^2+3x+3)$$

$$-e^x(x^3+3x^2-3x-3)$$

