

5. (10 pts) Find the equation of the line tangent to the graph of  $y = \frac{2-x^2}{x^2+2}$  at the point  $x = 1$ .

$$y' = \left( \frac{2-x^2}{x^2+2} \right)' = -2x(x^2+2)^{-1} - 2x(x^2+2)^{-2}(2-x^2)$$

$$y'(1) = -\frac{2}{3} - \frac{2 \cdot 1}{9} = -\frac{8}{9} \quad y(1) = \frac{1}{3}$$

eqn of line:  $y - \frac{1}{3} = -\frac{8}{9}(x-1)$

6. (10 pts) The data in the two tables below describes two functions. For each function, decide whether or not it is exponential. If it is, find a formula for it. If it is not then explain why it cannot be exponential.

t	f(t)
0	120
1	90
2	67.5
3	50.625
4	37.969
5	28.477

t	g(t)
0	120
1	90
2	60
3	30
4	0
5	-30

(a)  $f(t)$

$$\frac{90}{120} = \frac{3}{4} \quad \frac{67.5}{90} = \frac{3}{4} \quad \text{etc.}$$

yes,  $f$  is exponential:  $\frac{f(t+1)}{f(t)} = \frac{3}{4} \Rightarrow f(t) = 120 \cdot \left(\frac{3}{4}\right)^t$   
 $= 120 \cdot e^{t \ln(3/4)}$   
 $= 120 \cdot e^{-.288t}$

(b)  $g(t)$

$g$  is not exponential b/c  $g(4) = 0$  and  $g(5) < 0$

7. (10 pts) Given the following graph of  $f(x)$ , sketch the graph of the derivative,  $f'(x)$ .

