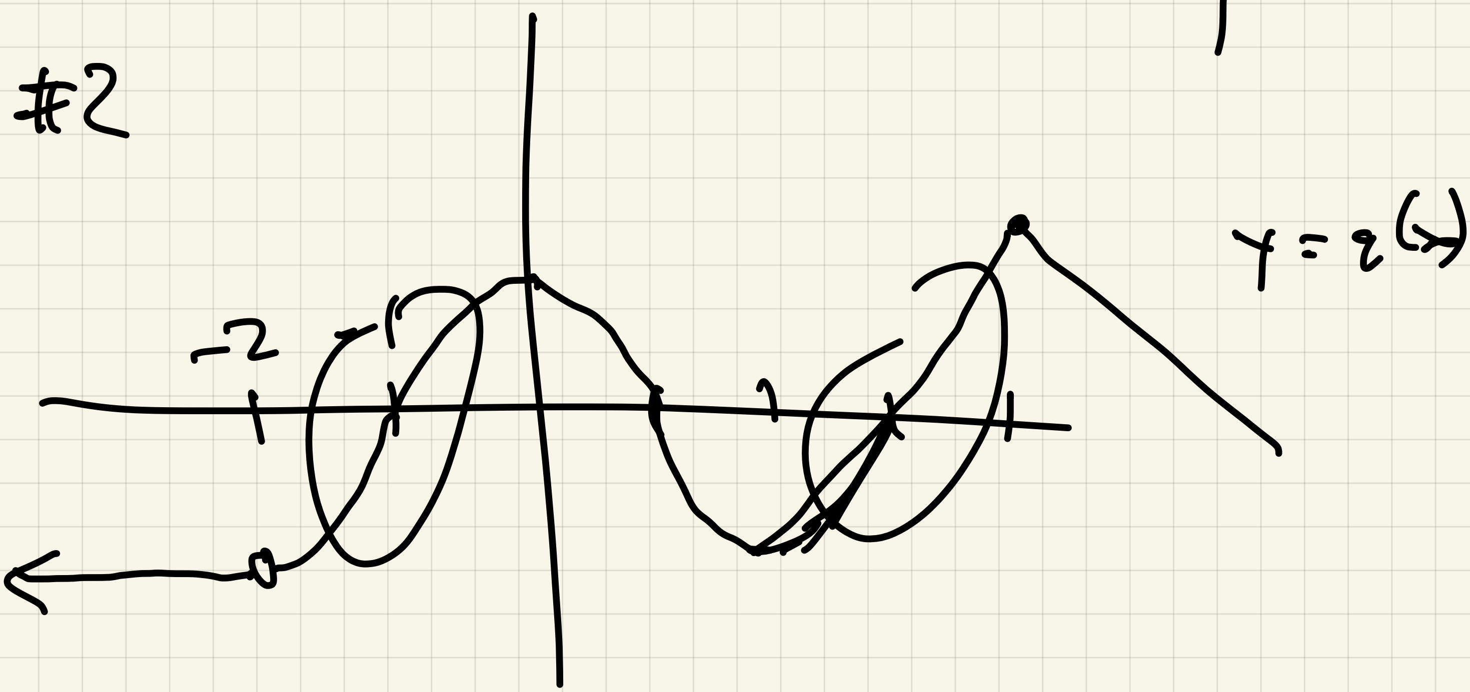
3/22/Calc I : Exam 2

avg 79%

150	
	6
135	
	4
120	
	5
105	
	4

#2

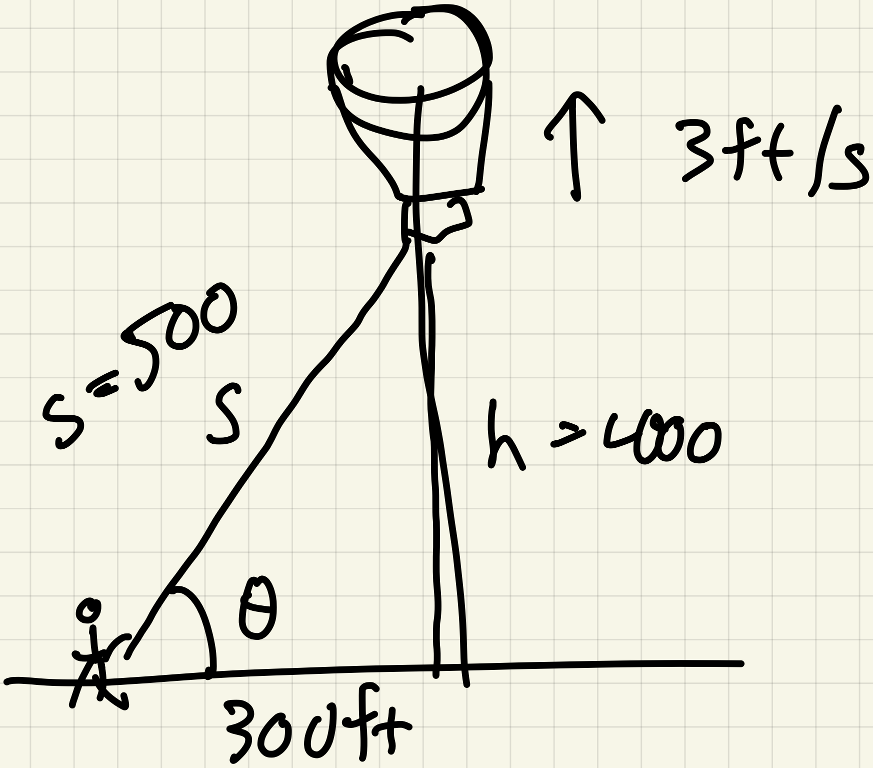


(a) $g'(x) = 0$ at $x = 0, 2$. and $(-\infty, -2)$

(b) $(-2, 0) \cup (2, 4)$

(c) $g'(x) = \text{DNE}$ $x = -2, 4$

6.



s= dist from obs to balloon
h= height of balloon

a) Rate of change of s when $h=400$ ft

b) Rate of change of θ

$\boxed{(a)}$ $s^2 = 300^2 + h^2$

$2s\frac{ds}{dt} = 0 + 2h\frac{dh}{dt}$

$s=500$ $h = 400$ $\frac{dh}{dt} = 3$ ft/s

$$s = \sqrt{300^2 + h^2}$$

$$\frac{ds}{dt} = \frac{1}{\cancel{2}}\left(300^2 + h^2\right)^{-\frac{1}{2}} \cdot \left(\cancel{2}h \cdot \frac{dh}{dt}\right)$$

$$= \frac{h\,\frac{dh}{dt}}{\sqrt{300^2 + h^2}}$$

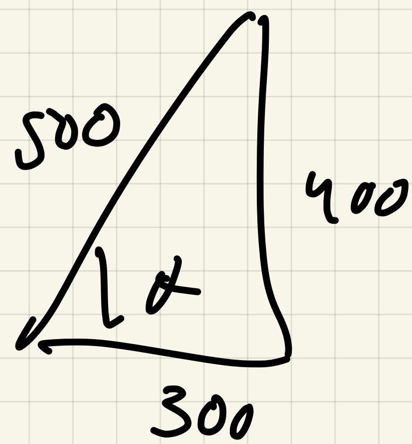
$$s^2 - h^2 = 300$$

$$\frac{ds}{dt} = \frac{12}{5} \text{ ft/sec.}$$

(b)

$$\sin\theta = \frac{h}{s}$$

$$\tan\theta = \frac{h}{300}$$



$$\sec^2\theta \, \frac{d\theta}{dt} = \frac{1}{300}\frac{dh}{dt}$$

$$\frac{d\theta}{dt} = \frac{1}{300} \cdot 3 \cdot \underbrace{\cos^2\theta}_{\left(\frac{3}{5}\right)^2} = \frac{9}{2500} \text{ rad/s}$$

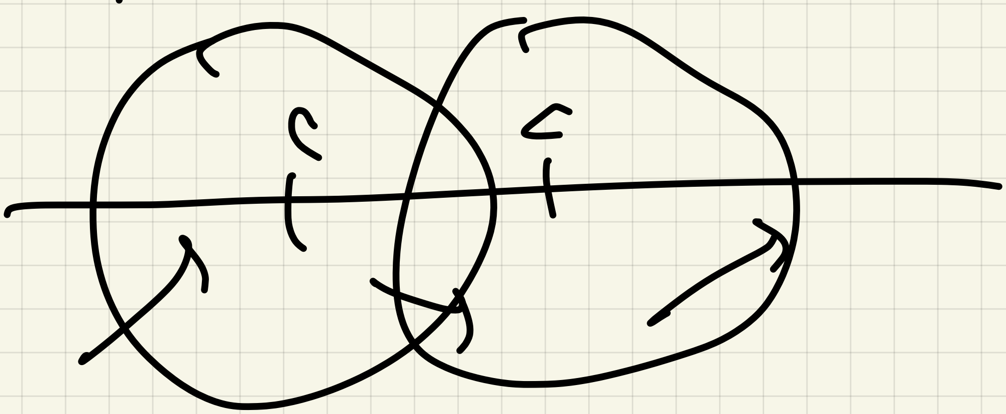
$$\theta = \arctan\left(\frac{h}{300}\right)$$

$$\frac{d\theta}{dt} = \frac{1}{1+\left(\frac{h}{300}\right)^2}\cdot\frac{1}{300}\frac{dh}{dt}$$

$$\left(\frac{4}{3}\right)^2 \qquad \frac{dh}{dt} = 3$$

§4.3 Incr/decr functions — key

$f' > 0$ $\qquad$ $f' < 0$



1st deriv test: If c crit pt:

① f' changes from $+$ to $-$ at c

$\Rightarrow f(c)$ rel max

② $\qquad -$ $\qquad +$

$f(c)$ rel min

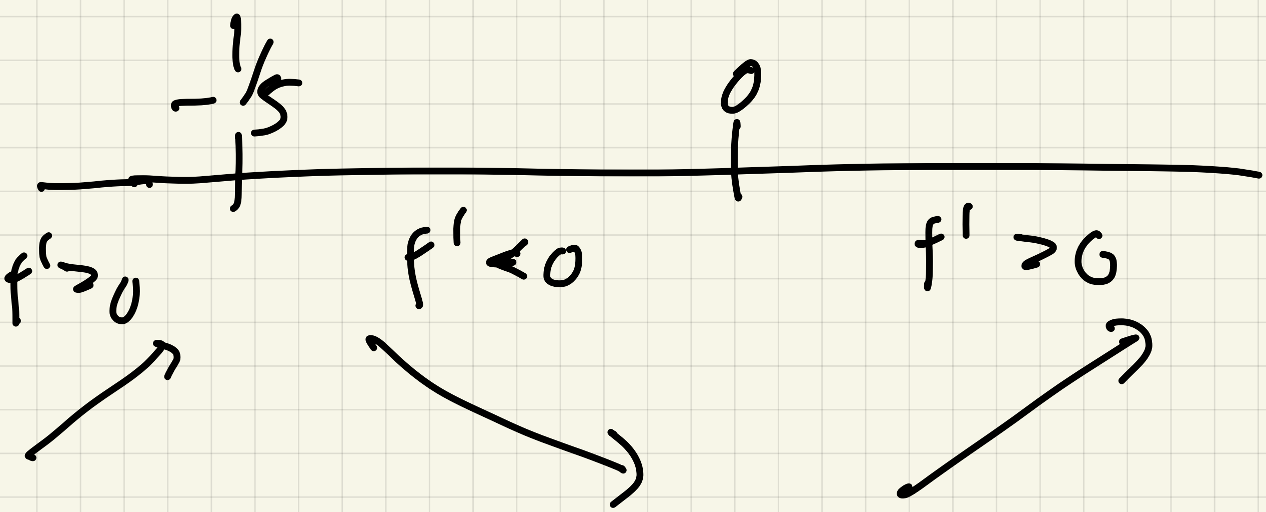
Ex $f(x) = x^2 \cdot e^{10x}$

$$f'(x) = 2x \cdot e^{10x} + x^2 \cdot e^{10x} \cdot 10$$

$$= e^{10x}\left(2x + 10x^2\right) = 0$$

$$2x(1+5x) = 0$$

$x = 0$ $\quad$ $x = -1/5$

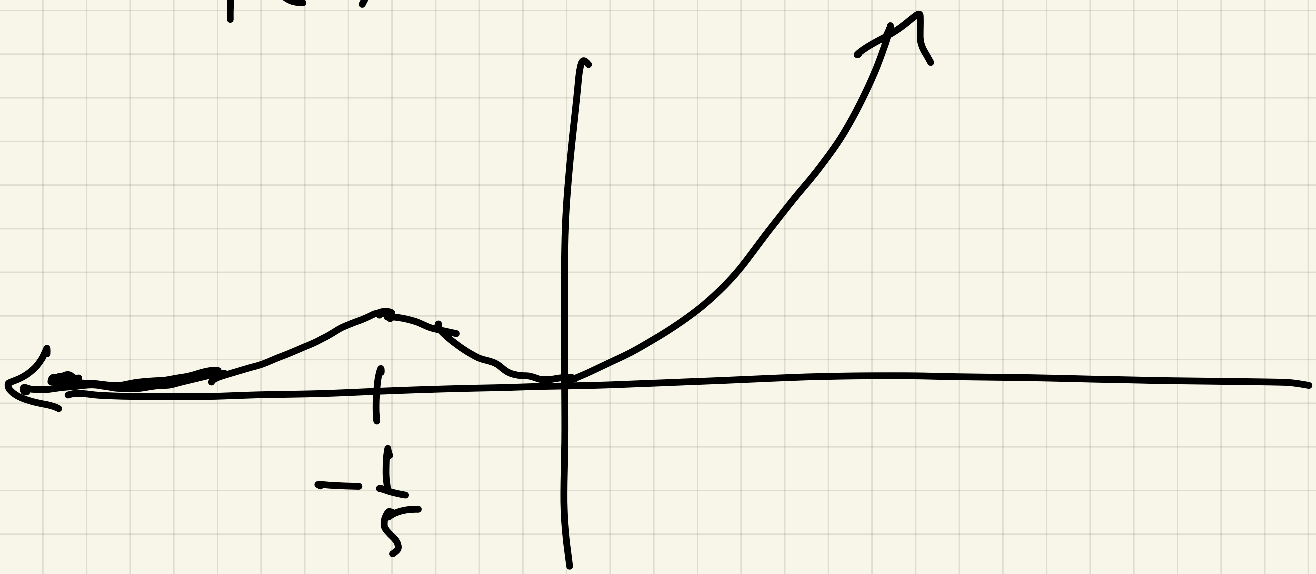


f incr on $\left(-\infty, -\frac{1}{5}\right) \cup (0, \infty)$

f decr $\left(-1/5, 0\right)$

$f(-\frac{1}{5})$ rel max

$f(0)$ rel min



$-\frac{1}{5}$

Ex2 $f(x) = (x^2-9)^{2/3}$

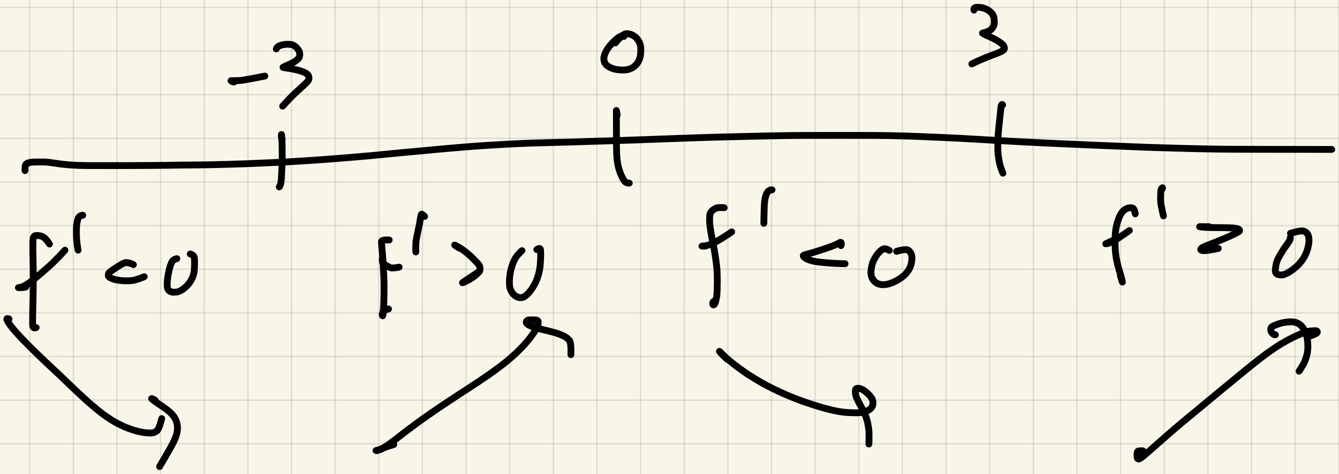
$$f'(x) = \frac{2}{3}(x^2-9)^{-1/3} \cdot (2x)$$

$$= \frac{4x}{3}(x^2-9)^{-1/3}$$

$$= \frac{4x}{3\sqrt[3]{x^2-9}}$$

f' DNE

crit pts $x=0$, $x=\pm 3$



f(-3), f(3) rel mins

f(0) rel max