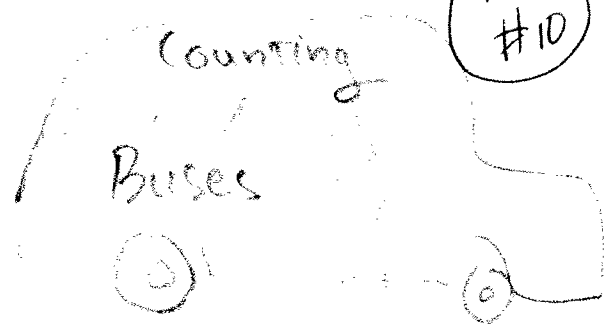
HW #10



3.2.16

$$\lim_{x\to\infty} \frac{e^x}{x^4}$$

$$= \lim_{x\to\infty} \frac{d}{dx} \frac{e^x}{x^4} = \lim_{x\to\infty} \frac{e^x}{4x^3}$$ L'Hopital's Rule

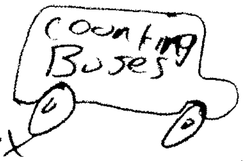
$$= \lim_{x\to\infty} \frac{d}{dx} \frac{e^x}{4x^3} = \lim_{x\to\infty} \frac{e^x}{12x^2}$$ L'Hopital's Rule

$$= \lim_{x\to\infty} \frac{d}{dx} \frac{e^x}{12x^2} = \lim_{x\to\infty} \frac{e^x}{24x}$$ L'Hopital's Rule

$$= \lim_{x\to\infty} \frac{d}{dx} \frac{e^x}{24x} = \lim_{x\to\infty} \frac{e^x}{24}$$ L'Hopital's Rule

$$= \frac{e^\infty}{24} = \frac{\infty}{24} = \infty$$

3.2-16



$\lim_{x\to\infty} \frac{e^x}{x^4}$ use L'Hopital $\frac{\frac{d}{dx}(e^x)}{\frac{d}{dx}(x^4)} = \lim_{x\to\infty}\frac{e^x}{4x^3}$ use L'Hopital

$\lim_{x\to\infty} \frac{\frac{d}{dx}e^x}{\frac{d}{dx}(4x^3)} = \lim_{x\to\infty} \frac{e^x}{12x^2}$ use L'Hopital $\frac{\frac{d}{dx}(e^x)}{\frac{d}{dx}(12x^2)} = \lim_{x\to\infty} \frac{e^x}{24x}$ use L'Hopital

$\lim_{x\to\infty} \frac{\frac{d}{dx}(e^x)}{\frac{d}{dx}(24x)} = \lim_{x\to\infty}\frac{e^x}{24} = \frac{\infty}{24} = \infty$

DGK

#71 $\lim_{x \to \infty} \frac{(\sqrt{x^2+1} - x)}{1} \cdot \frac{\sqrt{x^2+1} + x}{\sqrt{x^2+1} + x}$

$\lim_{x \to \infty} \frac{x^2+1 - x}{\sqrt{x^2+1} + x} = \frac{\infty}{\infty} \cancel{\Rightarrow 0}$ use l'hopital's Rule

$\lim_{x \to \infty} \frac{2x - 1}{\frac{1}{2}(x^2+1)^{-1/2}+1} = \frac{\infty}{1} = \infty$

$\to 0$

Double Helix

3.2 # 38 => Find the indicated limits.

$$\lim_{x \to 0^+} (\cos x)^{1/x}$$

$y = ((\cos x)^{1/x}$ convert to logarithim.

$$e^{\ln y} = e^{1/x \ln ((\cos x)}$$

l Hopital Rule

$$e^{\frac{-\frac{\sin(x)}{\cos(x)}}{1}} = e^{\frac{0}{1}} \to e^{0}$$

$$e^{\lim_{x \to 0^+} ((\cos x)^{1/x}} = e^{0} = 1$$

p. 241 / section 3 3/4

a) $f(x) = x^3 - 3x + 1$

$f'(x) = 3x^2 - 3$

$0 = 3x^2 - 3$

$0 = 3(x^2 - 1) \quad | :3$

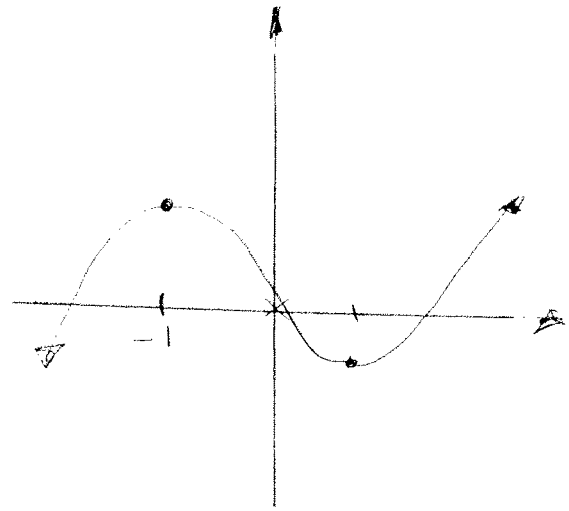
$0 = (x^2 - 1) \quad | +1$

$1 = x^2 \quad | \sqrt{\ }$

$x = \sqrt{1}$

$\underline{\underline{x_1 = 1}}$

$\underline{\underline{x_2 = -1}}$ } plug in f(x)



max (-1; 3)

min (1; -1)

b) $f(x) = -x^3 + 6x^2 + 2$

$f'(x) = -3x^2 + 12x$

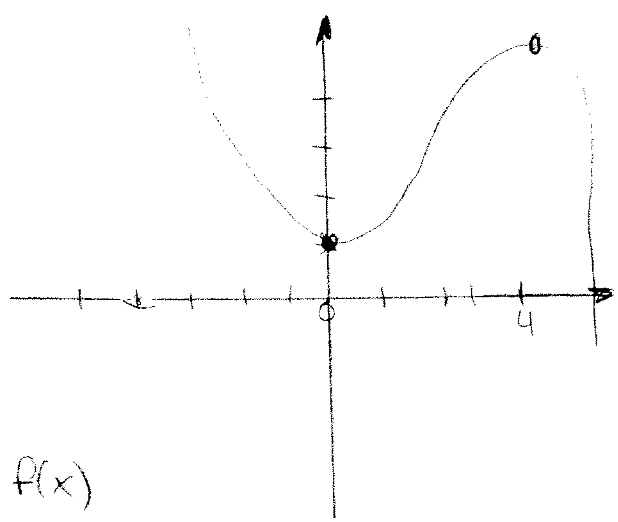
$0 = -3x^2 + 12x$

$0 = x(-3x + 12)$

plug in f(x) ← $\underline{\underline{x_0 = 0}}$ $\quad 0 = -3x + 12 \quad | -12$

$-12 = -3x \quad | :(-3)$

$\underline{\underline{4 = x_0}}$ → plug in f(x)



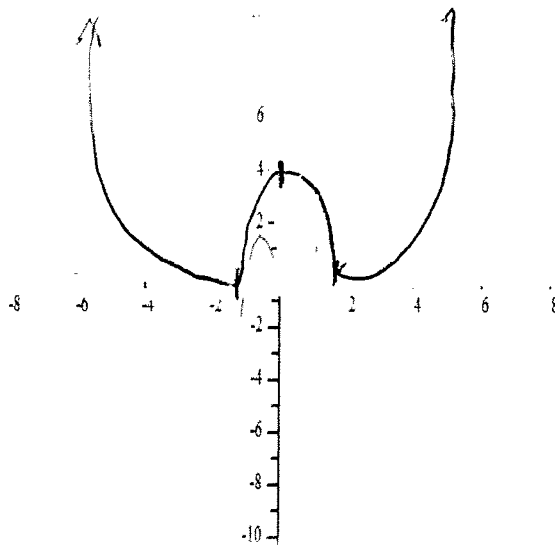
min (0; 2)

max (4; 34)

INVESTMENT BANKERS

3.3 Find all critical numbers by hand.

6. (a) $f(x) = x^4 - 2x^2 + 1$ (b) $f(x) = x^4 - 3x^2 + 2$



a. $f(x) = x^4 - 2x^2 + 1$

$f'(x) = 4x^3 - 4x$

$f'(x) = 4x(x^2 - 1)$

$4x = 0$

$x + 1 = 0$

$4x(x+1)(x-1) = 0$

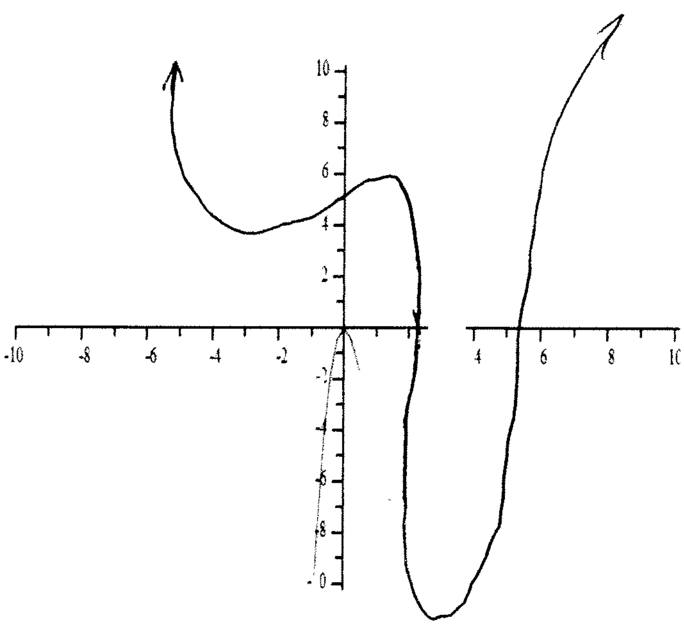
$x = -1$

Critical Numbers: $-1, 0, 1$ $-1, 1$ LOCAL MINI

$x - 1 = 0$

$x = 1$

-~~1 corresponds to a local Maximum and 1 to a local Mi~~nimum. 0 LOCAL MAX



b. $f(x) = x^4 - 3x^3 + 2$

$f'(x) = 4x^3 - 9x^2$

$x^2(4x - 9) = 0$

$x^2 = 0$ $4x - 9 = 0$

$x = 0$ $4x = 9$

$x = 2.25$

Critical Numbers: $0, 2.25$

0 corresponds to a local Maximum and 2.25 corresponds to a local Minimum.

Section 3.3

i.t.

find all critical #'s by hand
use graph calc to see if they are
either local min, max or neithe

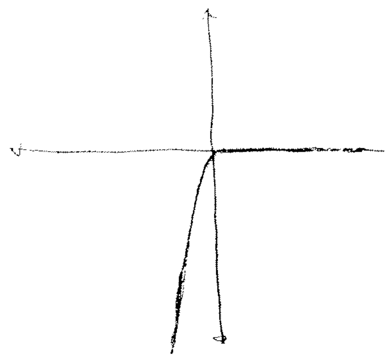
#16

$f(x) = xe^{-2x}$

$f(x) = \frac{dy}{dx} xe^{-2x}$

$= e^{-2x} \frac{d}{dx} -2x$

$f' = -2e^{-2x} = 0$



MAT Finisher

$$\lim_{N\to\infty}\left(1+\frac{R}{N}\right)^{NT}$$

$$e^{\ln \lim_{N\to\infty}\left(1+\frac{R}{N}\right)^{NT}}$$

$$e^{\lim_{N\to\infty} \ln\left(1+\frac{R}{N}\right)^{NT}}$$

$$e^{\lim_{N\to\infty} NT\ln\left(1+\frac{R}{N}\right)}$$

$$e^{T\lim_{N\to\infty}\frac{\ln\left(1+\frac{R}{N}\right)}{(N)^{-1}}} = \frac{0}{0}$$

$\to$ L'hopital

$$e^{T\lim_{N\to\infty}\frac{\frac{1}{\left(1+\frac{R}{N}\right)}\cdot\frac{d}{dN}\left(1+\frac{R}{N}\right)}{\frac{d}{dN}\left(N^{-1}\right)}}$$

$$e^{T\lim_{N\to\infty}\frac{1}{\left(1+\frac{R}{N}\right)}\cdot R(-N)}$$

$$\frac{d}{dN}\cdot N^{-} = -N^{2}$$

Mo [signature]
Hiroaki Tomioka

PURPLE PARROTS

3.3

36) $F(x) = x^2 e^{-4x}$ on a) $[-2,0]$ b) $[0,4]$

a) min = $(0,0)$

max = DNE

b) min $(4, 1.8 \times 10^{-6})$

max $(0.5, 0.033)$

a) $y_1 = x^2 e \wedge (-4x)$

Xmin = -2

Xmax = 0

zoom fit

calculator work

Calc. 3: Min

Left -2

Right 0

Guess: 0

$x = 0. \quad y = 0$

Repeat for Max.

3.4

#4

$$y = x^3 - 3x^2 - 9x + 1$$

$$y' = 3x^2 - 6x - 9 = 0$$

$$x^2 - 2x - 3 = 0$$

$$(x-3)(x+1) = 0$$

y' -1 3

$\ominus$

$y'(0) = -9$

Decreasing $(-1, 3)$

Increasing $(-\infty, -1) \cup (3, \infty)$

Abraham Sherman
Timothy Lukowicz

Biochemists

12) 3.4

Find the limits $\lim_{x \to 0} \frac{\tan x - x}{x^3}$

L'Hopital $\frac{\sec^2 x - 1}{3x^2} = \frac{0}{0}$

l'Hopital $\frac{2\sec x \cdot \sec x \tan x}{6x} = \frac{0}{0}$

l'Hopital $\frac{2\left[\sec^4 x + 2\tan^2 x \sec^2 x\right]}{6}$

$= \frac{2\left[1 + 2(0)\right]}{6}$

$= \frac{2}{6} = \frac{1}{3}$