Math 007A 030

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W48ZNG

1. $\lim_{x\to 7} \frac{1}{x+1} \to \lim_{x\to 7} \frac{1}{7+1} \to \frac{1}{8}$

b. $\lim_{x\to 1^-} \frac{|x-1|}{x-1} \to \frac{-(\cancel{x-1})}{\cancel{x-1}} \to -1$

c. $\lim_{x\to\infty} \frac{e^x - 2e^{2x} + e^{-3x}}{3e^x - e^{-x}}$ $(e^x = z)$

$\lim_{x\to\infty} \frac{z - 2z^2 + z^{-3}}{3z - z^{-1}}$

$\frac{\frac{z}{z} - \frac{2z^2}{z} + \frac{z^{-3}}{z}}{\frac{3z}{z} - \frac{z^{-1}}{z}} \to \frac{1 - 2z + z^{-2}}{3}$ $\infty$

$(x-2)(x-1)$

$x^2 - x - 2x + 2$

$x^2 - 3x + 2$

d. $\lim_{x\to 2} \frac{x^2 - 3x + 2}{\sin(x-2)}$

$\to \frac{(x-2)(x-1)}{\sin(x-2)} \cdot \frac{(x-2)}{\sin(x-2)} \to \frac{x-1}{2-1} = 1$

$\to (x-2)(x-1)$

2. 10g of chemical per liter

rate: 20 liters

$v(0) = 400$ liters

$v(0) = 0$g of chemicals

$\lim_{t\to\infty} c(t)$

$m(t)$

$c(t) = \frac{m(t)}{v(t)}$, $m(t)$

$\frac{10+0}{400+20t}$

$\frac{10}{400+20t} \rightarrow \frac{1}{40+2t}$

$\frac{10}{400+20(2)}$ $\frac{10}{440} \rightarrow \frac{1}{44}$

$\lim_{t\to\infty} \frac{1}{40+2t}$

6. $S(t) = (2+\sin(t))R^2(t)$ find $r = s$ $\frac{ds}{dt}$, at $t=\pi$

$S(t) = (2+\sin(t))R^2(t)$

$R(\pi) = 1.0$

and $\left.\frac{dR}{dt}\right|_{t=\pi} = 5.0$

$t = \pi$

$R(\pi) = 1.0$

$\left.\frac{dR}{dt}\right|_{t=\pi} = 5.0$

~~$(2+\sin(\pi))R^2(1.00)(\pi)$~~

$(2+\sin(\pi))R^2(\pi)$

$(2+\frac{ds}{dt}\sin(\pi))\frac{dR}{dt}R^2(\pi)$

$R(\pi) = 1$

$R^2(\pi) = 2$

10 12 $S = 12$

$\sin(x) = 0$
$\cos(x) = 1$

3. $\lim\limits_{x \to \infty} \frac{1}{x} \overbrace{\sin(x^2+3x+4)}^{0}$

$-\frac{1}{x} \leq \sin(x^2+3x+4 \leq \frac{1}{x}$

$0 \leq \frac{1}{x}\sin(x^2+3x+4) \leq 0$

$2x+3$

$-\frac{1}{2} \leq \sin(2x+3) \leq \frac{1}{2}$

4. $\lim\limits_{x \to 1} \frac{2^x - 2^1}{x-1} \rightarrow \frac{2^1 - 2^1}{1-1} \rightarrow \frac{0}{0}$ ↙ L'hospital

$2^{\#} \rightarrow \ln \#$

↳ $\frac{2}{1}$

ln2
or
2ln

$\lim\limits_{x \to 1} \ln(2)$

5. a) $(x^3-3x^2+1)'$

$3x^2-6x$

b) $(\sin(x^2-1)\cdot(2x+3))'$

$\cos(x^2-1)$ or $\cos(2x)$

$\cos(2x)(2x+3)+\sin(x^2-1)(2)$

c) $\left(\dfrac{\sin(x^2-1)}{2x+3}\right)'$

$\sin \rightarrow \cos$

$\dfrac{\sin(x^2-1)}{(2x+3)^2}\cdot\dfrac{(2x+3)}{(2x+3)} \rightarrow \dfrac{\cos(2x)}{(2x+3)^2}$

d) $(\sqrt{2x+3\sqrt{x+4\sqrt{x}}})$

$\dfrac{1}{\sqrt{2x+3}}\sqrt{x+4\sqrt{x}}\cdot\sqrt{2x+3}\,\dfrac{1}{\sqrt{x+4}}\sqrt{x}\cdot\dfrac{\sqrt{2x+3\sqrt{x+4}}\ 1}{\sqrt{x}}$

$\dfrac{1}{\sqrt{2}}\sqrt{x+4\sqrt{x}}\cdot\dfrac{\sqrt{2x+3}\sqrt{x}}{\sqrt{1}}\cdot\dfrac{\sqrt{2x+3\sqrt{x+4}}}{\sqrt{1}}$

7. tangent Line: $x^2+2y^2=3$ at $(1,-1)$

$x_0 = 1$ $\quad$ $2x+4y=0$ $\quad$ $y = -\frac{1x}{2}$

$y_0 = -1$ $\quad$ $\frac{4y}{4} = \frac{-2x}{4}$

$m = -\frac{1x}{2}$

$y - y_0 = m(x - x_0)$ $\quad$ $-\frac{2}{2}$

$-\frac{x}{2} \cdot \frac{x}{1}$ $\quad$ $y-(-1) = -\frac{x}{2}(x-1)$

$y+1 = -\frac{x^2}{2} + \frac{2x}{2}$

$-\frac{x^2}{2}$ or $2\cancel{x}$

$y+1 = \frac{-x^2}{2} + x$

$y = \frac{-x^2}{2} + x - 1$

8. $y = f(x) = \sin(\pi x^2)$, $0 \le x \le \sqrt{2}/2$

$f^{-1}(y)$ at $x = 1/2$ and $y = \sqrt{2}/2$

$y = f(x) = \sin(\pi x^2)$ $\quad$ $\left(\frac{1}{2}\right)^2 \to 3$

sin → cos

derivative

$\sqrt{2}/2 = f(1/2) = \sin(\pi(\frac{1}{2})^2)$ $\quad$ $\frac{1}{2} \cdot \frac{1}{2} = \frac{1}{4}$

$\sqrt{2}/2$ $\quad$ $\sin(\frac{1}{4}\pi)$

$f^{-1}(y) = 1$

9. $Y = f(x) = xe^{-3x}$ , $x \geq 0$

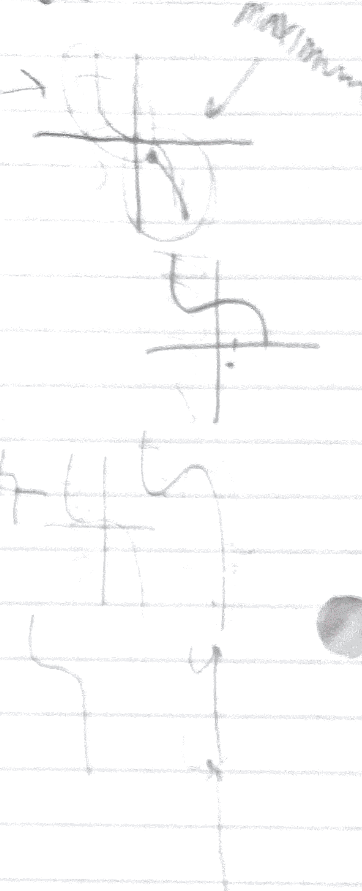
a) local maximum

critical point $(0,\infty)$

$-3x \cdot xe^{-4}$

$-3x \cdot xe^{-4} \cdot -3$

minimum




Greater than 0

$(1)e^{-3(1)} \rightarrow (2)e^{-3(2)}$

$1e^{-3}$ $\quad$ $2e^{-6}$ $\quad$ $(1,-3)$

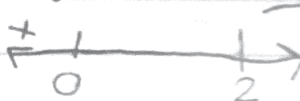
$-3e$ $\quad$ $-12e$

$3e^{-3(3)}$

$3e^{-9}$

$-27e$

b) inflection point




$(2,-12)$