Math101, Quiz # 3

Name: [illegible]

ID #: [illegible]

1. Find $\lim_{t\to+\infty} t-t^2$, then $\lim_{t\to+\infty} 2\tan^{-1}(t-t^2)$.

$\lim_{t\to\infty} t-t^2 \Rightarrow \infty-(\infty^2)=-\infty$

$\lim_{t\to+\infty} 2\tan^{-1}(t-t^2) \Rightarrow \lim 2\tan(-\infty) =$

2. Use the Intermediate Value Theorem to show that the equation $e^{-x}=2x$ has a root in the interval $(0,1)$.

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

① $P(0)=2\cdot(0)-e^{0}=-1 < 0$

② $P(1)=2\cdot(1)-\frac{1}{e}=2-\frac{1}{e}=+\text{num} > 0$

from ①, ② we find that there is a point $P(c)$ wher the value of $f(x)=0$

3. Find the vertical and horizontal asymptotes of the curve $y=\frac{x^2+2}{x^3+x}$. using limits

$\lim_{x\to\infty} \frac{x^2+2}{x^3+x} \Rightarrow \frac{\lim x^2/x^3 + \lim 2/x^3}{\lim x^3/x^3 + \lim x/x^3}$

$\frac{\lim 1/x + \lim 2/x^3}{1 + \lim 1/x^2} = \frac{0+0}{1+0}=0$

4. Find the equation of the tangent line to the curve $y=\sqrt[3]{1+\tan(3x)}$ at the point $(0,1)$.

$x=0 \quad y=1$

$\lim_{h\to0} \frac{f(x+h)-f(h)}{h} \Rightarrow \lim_{h\to0} \frac{(1+\tan3(x+h))^{1/3}-(1+\tan3h)^{1/3}}{h}$ $x=0$

$\frac{(1+\tan3h)^{1/3}-(1+\tan3h)^{1/3}}{h} \Rightarrow \frac{0-0}{0}=$ [illegible]

equation

$=\frac{y-1}{x-0}=1$

$y-1=x$

eq.: $y=x+1$