Math 1700 Summer 2013
Quiz 4
Wednesday June 12 2013
No Work = No Credit

Name: ______________________ **Student Number:** ______________________

1. (5 points) Evaluate the integral $\int \frac{t^2}{\sqrt{1-t^6}}dt$.

Solution:

Try the substitution $u = t^3$. Then $\frac{du}{dt} = 3t^2$, and $dt = \frac{du}{3t^2}$.

$= \int \frac{t^2}{\sqrt{1-t^6}}dt$

$= \int \frac{t^2}{\sqrt{1-u^2}} \frac{1}{3t^2} du$

$= \int \frac{1}{\sqrt{1-u^2}} \frac{1}{3} du$

$= \frac{1}{3} \int \frac{1}{\sqrt{1-u^2}} du$

$= \frac{1}{3} \sin^{-1}(u) + C$

$= \frac{1}{3} \sin^{-1}(t^3) + C$

2. (5 points) Find the limit: $\lim_{x\to\infty} x^{1/x}$.

Solution:

$\lim_{x\to\infty} x^{\frac{1}{x}}$

$= \lim_{x\to\infty} (e^{\ln(x)})^{\frac{1}{x}}$

$= \lim_{x\to\infty} e^{\frac{\ln(x)}{x}}$

Since e^z is continuous for all z, the exponential function commutes with the limit:

$= e^{\lim_{x\to\infty} \frac{\ln(x)}{x}}$

The exponent is an indeterminate form of type ∞/∞. We use l'Hopital's rule:

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

$= e^{\lim_{x\to\infty} \frac{\frac{1}{x}}{1}}$

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$= e^{\lim_{x\to\infty} \frac{1}{x}}$

$= e^0$

$= 1$