CALCULUS I
2015 Spring Midterm Exam

Dept. or School		Year		proctor	
Student ID		Name			

※ Your answer must be provided with descriptions how to get the answer.

1. (a) (7 points) Let $g(x)=\int_{-x^2}^{x^2} e^{-(x-2t)^2}dt$. Find $g'(x)$.

(b) (7 points) Find the value of $f'(0)$ if $f(x)$ is defined as $\int_0^{3x}(1+\sin^{-1}t)dt+\int_0^{x+\pi}\sec^2\left(\frac{t}{4}\right)dt+\ln(f(x)-2)=4$.

2. (a) (7 points) Express $\tanh^{-1}x$ using a natural logarithmic function.

(b) (7 points) Find linearization $L(x)$ of $f(x)=\tanh^{-1}x$ at $a=0$ and use it to estimate $f(0.01)$.

3. (a) (5 points) Evaluate the indefinite integral:

$$\int x \ln(x)\, dx .$$

(b) (7 points) Evaluate the definite integral:

$$\int_{\pi/6}^{\pi/3} \sin x \cos x \ln(4 \sin x \cos x)\, dx .$$

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4. (a) (7 points) Evaluate the indefinite integral:

$$\int \frac{1}{x^3+1}\,dx.$$

(b) (7 points) Evaluate $\int \ln(x^3+1)\,dx$.

5. (5 points) Use Newton's method with initial approximation $x_1 = 1$ to find x_2, the second approximation to the root of the equation $x^4 - x - 1 = 0$.

6. (7 points) Evaluate the improper integral:

$$\int_1^{\infty} \frac{\ln x}{x\sqrt{x}}\,dx.$$

7. (a) (7 points) Show that

$$\int_0^{\pi/2} \frac{1}{1+\tan x}\,dx = \int_0^{\pi/2} \frac{\tan x}{1+\tan x}\,dx.$$

(b) (7 points) Assuming that $\int_0^{\pi/2} \frac{1}{1+\tan x}\,dx$ converges, find the value by using (a).