Total: 30 pts (=15% of the final grade) Time allowed: 50 minutes.

You are not allowed to use any electronic devices, such as calculators, laptops or phones, during the test. Please show your steps clearly.

1. (10 pts)

   (a) (4 pts) Compute the followings:

$$\frac{d}{dx}(2\sin^{-1}x), \quad \frac{d}{dx}\left(\tan^{-1}(-x)\right), \quad \int \frac{2}{x^2-1}dx, \quad \int \frac{2}{\sqrt{x^2-1}}dx$$

   (b) (1 pts) Expand $(x+2)^2-4$.

   (c) (5 pts) Compute

$$\int \frac{1}{\sqrt{x^2+4x}}dx$$

2. (10 pts)

(a) (3 pts) Compute $\lim_{x\to 0} \dfrac{e^{2x}-1}{\sin x}$.

(b) (3 pts) Compute $\lim_{x\to 0^+} x^2(\ln x)$.

(c) (4 pts) Compute $\lim_{x\to\infty} \sqrt{x}e^{-\frac{x}{2}}$.

3. (10 pts)

(a) (3 pts) State the definitions of $\sinh x$, $\cosh x$ and $\operatorname{sech} x$.

(b) (2 pts) Compute $\sin^{-1}(\frac{1}{\sqrt{2}})$ and $\tan^{-1}(\sqrt{3})$.

(c) (5 pts) Are the following true or false? (No need to give explanation.)

i. $\sin(-x) = -\sin x$.

ii. $\cos(-x) = -\cos x$.

iii. $2\pi = 180°$.

iv. $\sin^{-1}(\sin 3\pi) = 3\pi$.

v. $\sin^{-1} 0 = 0$.

vi. $\cos^{-1} 0 = 0$.

vii. $0 \leq \sin x \leq 1$.

viii. $\sin(2x) = 2\sin x$.

ix. $\cosh^2 x + \sinh^2 x = 1$.

x. $\frac{d}{dx}\cosh x = -\sinh x$.

xi. You like this course.