THE CHINESE UNIVERSITY OF HONG KONG
DEPARTMENT OF MATHEMATICS

MATH1520C University Mathematics for Applications 2014-2015
Test 2, 12 Mar, 2015

- Time allowed: 45 minutes
- Answer all questions.
- Show your work clearly and concisely in your answer book.
- Write down your name and student ID number on the front page of your answer book.
- You are allowed to use a calculator in this test.

1. Find the following integrals:
   (a) $\displaystyle\int \frac{x^2+3x-2}{\sqrt{x}}\,dx$
   (b) $\displaystyle\int e^x + x^e + 2^x\,dx$
   (c) $\displaystyle\int 12x(3x^2+1)^{2015}\,dx$
   (d) $\displaystyle\int -\frac{1}{2}e^{\sqrt{x}}\,dx$

(40 points)

2. Find the function $f(x)$ such that $f''(x) = e^x$, $f(0) = 2$ and $f(1) = 3 + e$.

(20 points)

3. Find the following integrals:
   (a) $\displaystyle\int \frac{x^3-2x+1}{x+1}\,dx$
   (b) $\displaystyle\int \frac{18-x}{12x^2-7x-12}\,dx$

(20 points)

4. (a) Find $\dfrac{d}{dx}e^{x^2}$.
   (b) Prove for any natural number n,
   $$\int x^{2n+1}e^{x^2}\,dx = \frac{1}{2}x^{2n}e^{x^2} - \int nx^{2n-1}e^{x^2}\,dx.$$
   (c) Hence, find $\displaystyle\int x^9 e^{x^2}\,dx$.

(20 points)