MATHEMATICS 101 Section 211
Quiz #5, February 27, 2012
Show all your work. Use back of page if necessary. Calculators are not allowed.

Last Name: **First Name:** **UBC Stud. No.:**

1) Write down the Simpson's rule expansion for the integral $\int_0^{1.5} \cos(x^2)\,dx$ explicitly in terms of the function when $n = 6$ (so S_6 in the textbook notation). Do not evaluate. (1 point)

2) For $\int_0^1 \sin(x)\,dx$, how large does n have to be in order to guarantee that the exact value of the aforementioned integral differs from S_n, the approximation given by Simpson's rule, by at most 0.0001? Estimate your answer so that your final answer gives an explicit integer value for n. You may use the fact that the error made in using the Simpson's rule approximation to approximate $\int_a^b f(x)\,dx$ satisfies

$$|E_S| \leq \frac{K(b-a)^5}{180n^4}$$

where $|f^{(4)}(x)| \leq K$ for $a \leq x \leq b$. (Recall $f^{(4)}(x) = f''''(x)$) (2 points)

HINT: Some or all of the following values may be useful in your estimation

$$2^4 = 16 \qquad 3^4 = 81 \qquad 4^4 = 256 \qquad 5^4 = 625 \qquad 6^4 = 1296 \qquad 7^4 = 2401$$

3) Factor $x^3 - x^2 - x - 2$ into irreducibles and justify that the terms you are left with are irreducible . (2 points)

4) Evaluate $\int \frac{3x^2 - 4x + 9}{(x+1)(x^2 - 2x + 5)}\,dx$. **HINT:** This problem has been repeated on the back of the page. (5 points)

(REPEATED FROM FRONT) Evaluate $\displaystyle\int \frac{3x^2 - 4x + 9}{(x+1)(x^2 - 2x + 5)}\, dx$.