Integration by Partial Fractions and Numerical Approximation.

You are to provide full solutions to the following problems. You are allowed to collaborate with your classmates, use your notes and textbook and ask the TA for guidance. Direct copying of solutions is not encouraged, nor is it allowed or ethical.

Last name: __________________________ First name: __________________________

Student number: __________________

(Please indicate your student number on the first page of the solutions, but not your name.)
1. State the form of the partial fraction decomposition of the function $f(x) = \frac{2x - 15}{x(1 - 4x)^3(2x^2 + 5)^2}$. Do not determine the constants in the decomposition.

2. Evaluate $\int \frac{x^2 + 5}{x^3 + 2x} \, dx$

3. Find the partial fraction decomposition of $f(x) = \frac{x}{(x + 6)^5}$

4. Evaluate $\int \frac{1}{x^2(x^2 + 3)} \, dx$.

5. $\int \frac{\sqrt{x}}{x - 4} \, dx$

6. Approximate $\int_0^1 e^{x^2} \, dx$ using the Trapezoidal Rule, $n = 10$, and estimate the error.

7. Approximate $\int_0^1 e^{x^2} \, dx$ using the Simpson Rule, $n = 10$, and estimate the error.

8. Find how large $n$ must be to find $\int_0^{\pi/2} \sin^2(x) \, dx$ to an error of less than 0.001, using the Trapezoidal rule.

9. Find how large $n$ must be to find $\int_0^{\pi/2} \sin^2(x) \, dx$ to an error of less than 0.001, using the Simpson rule.