Practice Midterm 2

Problem 1
A bag containing $1 million dollars (in 100's) is 12 kg. It is lifted at a constant rate of 6 m/s. The money leaks out of the bag at a constant rate of 2 kg / s. Assuming gravity is $9.8 m/s^2$. Find the height, h, at which the work needed to lift the bag is 1,396.5 Joules.

Problem 2

1. $\int \frac{1}{x^{1/2}+x^{1/3}}\,dx$
2. $\int \frac{(x-2)}{(x^2-4)(x^2+2x+2)}\,dx$
3. $\int_0^{\sqrt{5}} (9-x^2)^{-3/2}\,dx$
4. $\int \frac{3\sec(x)\tan(x)}{(3\tan(x))^3}\,dx$
5. $\int_0^{\pi} x\sin^2(x)\cos(x)\,dx$

Problem 3

1. Use the comparison test to determine if $\int_0^1 \frac{1}{x^{1/2}+x^{1/3}}\,dx$ converges or diverges.
2. Evaluate
$$\int_1^\infty \frac{1+e^x}{e^x-e^{2x}}\,dx$$

Problem 5

Use Simpson's Rule with $n = 6$ to approximate the integral

$$\int_2^5 \frac{1}{\ln(x)}\, dx$$

Maintain at least 4 digits of precision at all times.