Math 125 G - Winter 2009
Mid-Term Exam Number Two
February 26, 2009
Answers

1. (a) partial fractions

$$-\frac{1}{12}\log\left(|2x+1|\right)+\frac{1}{3}\log\left(|x-1|\right)+\frac{1}{2}x+C$$

   (b) trig substitution

$$-\frac{1}{3}x^2\sqrt{1-x^2}-\frac{2}{3}\sqrt{1-x^2}+C$$

2. substitution (e.g. $u=\sqrt{x}$) then integration by parts

$$2\left(\cos\left(\sqrt{x}\right)(2-x)+4\sin\left(\sqrt{x}\right)\sqrt{x}\right)+C$$

3. complete the square, then trig substitution

$$\frac{x-2}{96\sqrt{x^2-4x+12}}+\frac{x-2}{24\left(x^2-4x+12\right)^{\frac{3}{2}}}+C$$

4. This integral is improper: the integrand is undefined at $x=0$, which is within the limits of integration. Use a substitution (e.g. $u=e^x$ or $u=e^x-1$), and then partial fractions to get an antiderivative. Evaluating the appropriate limits, one finds that the integral is divergent.

5. integration by parts

$$\frac{1}{2}$$

6. volume $=1000\pi g\int_0^3(4-y)^2(3-y)\,dy$