Practice Exam I A

Evaluate the following integrals:

1. $\int \frac{dx}{\sqrt{x}(1+\sqrt{x})}$

2. $\int \frac{dx}{(x^2-1)^2}$

3. $\int \frac{x^3\,dx}{\sqrt{x^2+4}}$

4. $\int t^2 \cos t\,dt$

5. Does the improper integral $\int_0^4 \frac{dx}{x^2-7x+10}$ converge or diverge? If it converges, find its value. Justify your answer.

6. Find the volume of the three dimensional region obtained by revolving about the x-axis the part of the first quadrant below the curve $y = \frac{1}{x^{2/3}}$ for $1 \le x < +\infty$.

Practice Exam I B

Evaluate the following integrals:

1. $\int \frac{2s}{\sqrt{1-s^4}}\,ds$

2. $\int (x^2-5x)e^x\,dx$

3. $\int \frac{8\,dw}{w^2\sqrt{4-w^2}}$

4. $\int_0^\infty \frac{dv}{(1+v^2)(1+\tan^{-1}v)}$

5. $\int \frac{2s+2}{(s^2+1)(s-1)^3}\,ds$

6. Find the area of the region above the x-axis and below the curve $y = \frac{1}{x^2-2x+5}$, $-1 \le x \le 3$.

Practice Exam 1 C

Evaluate the following integrals.

1. $\int e^y \csc(e^y+1)\,dy$

2. $\int_{2/\sqrt{3}}^{2} t \sec^{-1} t \, dt$

3. $\int \frac{9x^3-3x+1}{x^3-x^2}\,dx$

4. $\int \frac{dx}{(x^2-1)^{3/2}}$

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

6. Do the following integrals converge or diverge? Justify your answer.

   (a) $\int_3^{\infty} \frac{\ln x}{\sqrt{x}}\,dx$

   (b) $\int_1^{\infty} \frac{dx}{x^2+3x+\sin x}$

Answers – Exam I A

1. $2\ln(1+\sqrt{x})+C$

2. $\frac{1}{4}\ln\left|\frac{x+1}{x-1}\right| - \frac{x}{2(x^2-1)}+C$

3. $\frac{1}{3}(x^2+4)^{3/2} - 4\sqrt{x^2+4}+C$

4. $(t^2-2)\sin t + 2t\cos t + C$

5. diverges

6. 3π

Answers – Exam I B

1. $\sin^{-1}(s^2)+C$

2. $(x^2-7x+7)e^x + C$

3. $\frac{-2\sqrt{4-w^2}}{w}+C$

4. $\ln\left(1+\frac{\pi}{2}\right)$

5. $\frac{-1}{(s-1)^2} + \frac{1}{s-1} + \tan^{-1}s + C$

6. $\frac{\pi}{4}$

Answers – Exam I C

1. $-\ln|\csc(e^y+1)+\cot(e^y+1)|+C$

2. $\frac{5\pi-3\sqrt{3}}{9}$

3. $9x + 2\ln|x| + \frac{1}{x} + 7\ln|x-1| + C$

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

5. $\ln(x^2+2x+2) - 7\tan^{-1}(x+1)+C$

6. (a) diverge (b) converge