Question 1: (Substitution Method)

(a) Determine $\int \frac{\cos(\sqrt{x})}{\sqrt{x}}\,dx$.

[2]

(b) Determine $\int \frac{x^2+2x}{\sqrt{x^3+3x^2+5}}\,dx$.

[2]

(c) Evaluate $\int_0^1 (1-x)^{20}x\,dx$.

[3]

(d) Evaluate $\int_0^{\pi/4} \frac{\sec^2 x}{\sqrt{1-\tan^2 x}}\,dx$.

[3]

Question 2: (Integration by Parts)

(a) Evaluate $\int x \sec^2 x \, dx$.

[5]

(b) Determine $\int_1^e x(\ln x)^2 \, dx$.

[5]

Question 3: (Trigonometric Integrals)

(a) Evaluate $\int \tan^2(x)\sec^6(x)\,dx$.

[5]

(b) Determine $\int_0^{\pi} \sin^2(\theta/4) - \cos^2(\theta/4)\,d\theta$.

[5]

Question 4: (Trigonometric Substitution) Determine

$$\int \frac{\sqrt{x^2-4}}{x^2}\,dx$$

[10]

Question 5: (Partial Fractions) Determine

$$\int \frac{8(x-3)}{(x-1)(x+3)^2}\,dx$$

[10]