

1. (15%) Evaluate $\int_0^\infty \frac{dx}{\sqrt{x(x+1)}}$.

2. (15%) Evaluate the limit, using L'Hôpital's rule.

$$\lim_{x \rightarrow 0^+} (e^x + x)^{2/x}.$$

3. (15%) Find the arc length of the graph of $f(x) = \frac{1}{2}x^2$ from $x = 0$ to $x = 1$.

4. (15%) Find $\int \sin^3 x \cos^4 x dx$.

5. (10%) Find the integral $\int \frac{1}{x^2 - 5x + 6} dx$.

6. (10%) Use the formula for arc length to show that the circumference of the circle $x^2 + y^2 = 1$ is 2π .

7. (10%) Find $\int x^2 \sin x dx$.

8. (10%) Find the area of the surface formed by revolving the graph of $f(x) = x^2$ on the interval $[0, \sqrt{2}]$ about the y -axis.