Name: _____

FINAL EXAM ♣

May 7, 2024

MATH 201

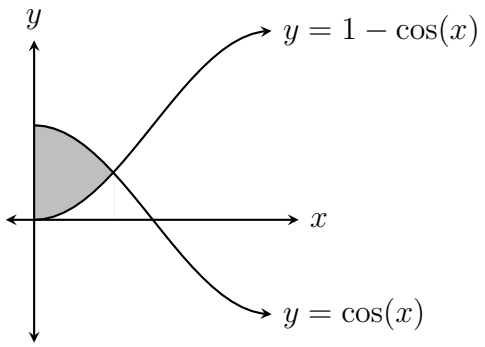
R. Hammack

1. $\int x^2 e^x \, dx =$

2. $\int \frac{(1+\ln(x))^5 \ln(x)}{x} \, dx =$

3. $\int \sec^4(x) \tan(x) \, dx =$

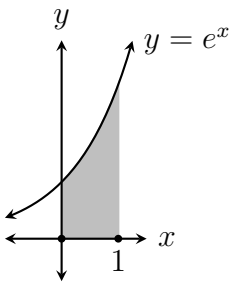
4. Find the area of the shaded region.



5. $\int \sqrt{1-x^2}\,dx =$

6. $\int \dfrac{5-x}{x^2-5x+6}\,dx =$

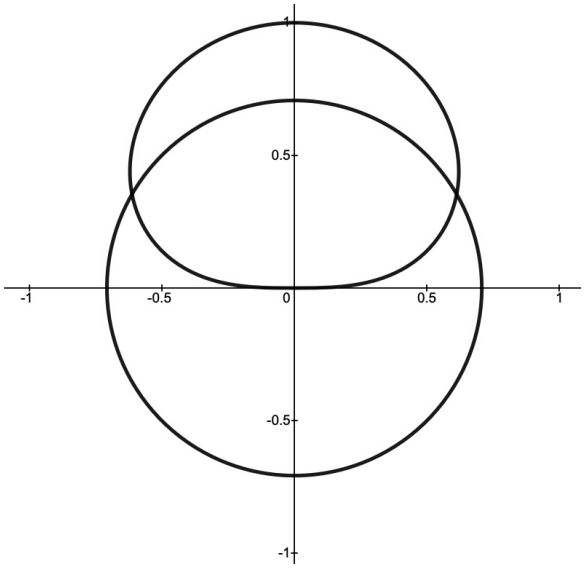
7. The shaded region is rotated around the x-axis. Find the volume of the resulting solid.



8. The region bounded by $f(x) = (x-3)^2$ and $g(x) = 2x - 6$ is rotated around the y-axis. Find the volume of the resulting solid.

9. The graphs of the polar equations $r = \sqrt{\sin(\theta)}$ and $r = \dfrac{1}{\sqrt{2}}$ are shown below.

   Find the area inside $r = \sqrt{\sin(\theta)}$ and outside $r = \dfrac{1}{\sqrt{2}}$.



10. Find the arc length of the curve $y = \ln(x) - \dfrac{x^2}{8}$ between $x = 1$ and $x = 2$.

11. $\int x\, e^{x/3}\, dx =$

12. Find $\int_{-\infty}^{0} x\, e^{x/3} dx$.

13. Does the series $1 - \frac{1}{2} + \frac{1}{3} - \frac{1}{4} + \frac{1}{5} - \frac{1}{6} + \frac{1}{7} + \cdots$ converge? If so, to what number?

14. What function is represented by the power series $\sum_{k=0}^{\infty} x^{2k}$?

15. Find the interval of convergence of the series $\sum_{k=1}^{\infty} \frac{(-1)^k x^k}{k+1}$. Be sure to test endpoints, if appropriate.

16. Use any appropriate test to determine if the series $\sum_{k=1}^{\infty} \frac{\ln(k)}{\ln(k+1)}$ converges or diverges.

17. Use any appropriate test to determine if the series $\sum_{k=2}^{\infty} \frac{1}{\sqrt{k-1}}$ converges or diverges.

18. Use the Maclaurin series for e^x to obtain a power series representation for $g(x) = \frac{e^x - 1 - x}{x}$.

19. Use the Binomial Theorem to write the first three terms of a power series for the function $(1 + x)^{1/2}$.

20. Write a third-degree Taylor polynomial $p_3(x)$ centered at $x = 2$ for the function $f(x) = \ln(3x - 5)$.