172 Final Name: _____

Find the following:

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

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

3. $\int x\cos(x)dx$

4. $\int x^3 \log(x) dx$

5. $\int \frac{x^4}{x-1} dx$ Hint, easiest to divide!

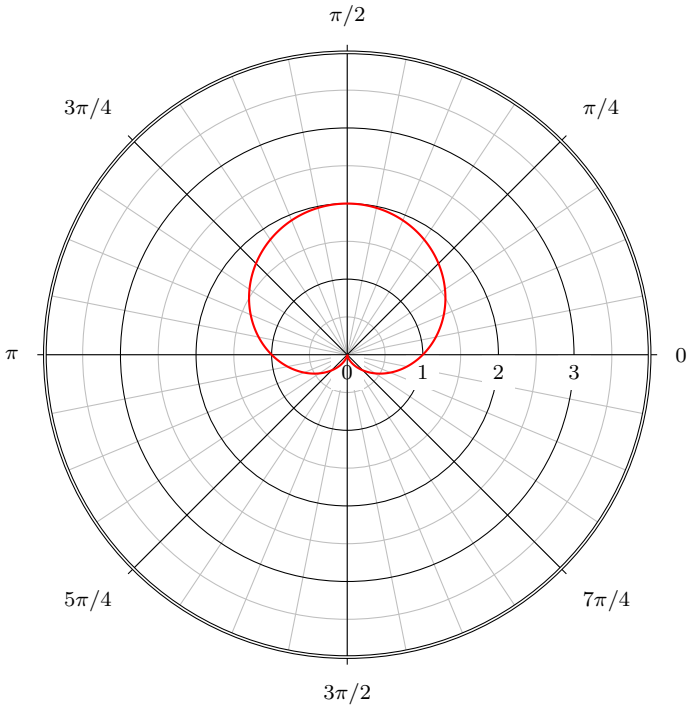
6. $\int \frac{1}{1+e^x} dx$

7. Find the volume of the solid resulting from rotating $y = x + 1$ about the x axis from $x = 1$ to $x = 4$

Find the improper integral:

8. $\int_3^7 \frac{dx}{\sqrt{x-3}}$

9. Find the area enclosed by the curve $r = 1 + \sin(\theta)$



10. Find the points on the graph $x = t^2 + t, y = t^3 - 3t^2$ where the tangent is horizontal.

11. Find the sum
$$\sum_{n=0}^{\infty} \left(\frac{2}{3}\right)^n$$

12. Test the series
$$\sum_{n=1}^{\infty} \frac{n!}{2^n}$$ for convergence using the ratio test.

13. Find the radius of convergence and the interval of convergence for

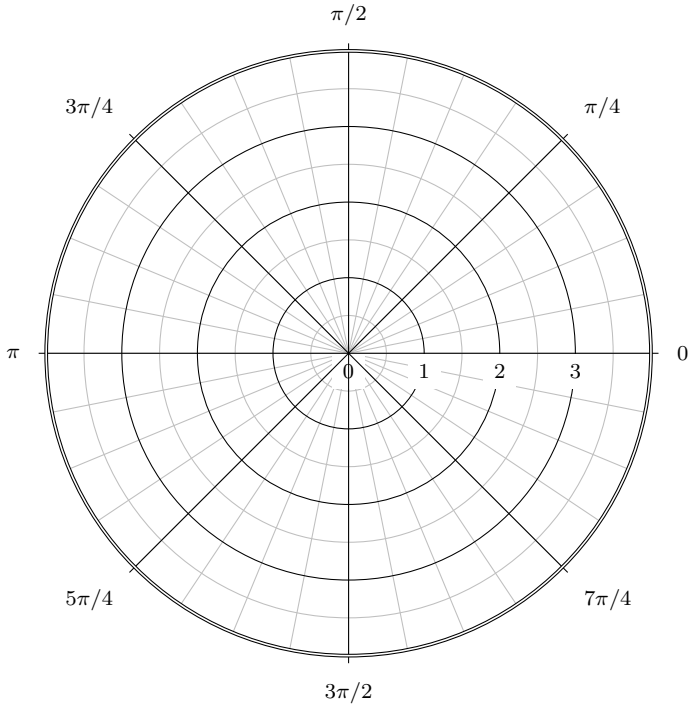
$$\sum_{n=1}^{\infty} \frac{(x-3)^n}{n2^n}$$

14. Find the Maclaurin Series for
$f(x) = xe^x$

15. Find the equation in standard form for the ellipse with foci $(3, 0), (7, 0)$ and vertices $(0, 0), (10, 0)$

16. Identify the eccentricity and the conic given by

$r = \dfrac{6}{1 + 2\cos(\theta)}$ and plot 4 points on the graph for $\theta = 0, \frac{\pi}{2}, \pi, \frac{3\pi}{2}$



17. Define $\log(x)$

18. Define b^x

For example:

(a) $2^{\sqrt{\pi}} =$

(b) $\sin(x)^x =$

(c) $\left(1 + \frac{2}{x}\right)^x =$

19. Find $\lim_{n \to 0} (\sin(x))^x$

Pick one for extra credit

20. Find the Maclaurin Series for $\arctan(x)$ by using the fact that $\arctan'(x) = \frac{1}{1+x^2}$

21. Find the first 4 terms of the sequence

    $a_1 = 1, a_{n+1} = 1 + \dfrac{1}{1 + a_n}$

    Then find $\lim\limits_{n\to\infty} a_n$