Name: _____

Write all of your responses on the extra paper provided. Put your name at the top of all the pages. Show all your work, answers without supporting justification will not receive credit. Each exercise is worth 15 points.

1. Using the Definition of the Definite Integral in left-hand endpoint form find

$$\int_0^1 x^3 - 3x^2 \, dx$$

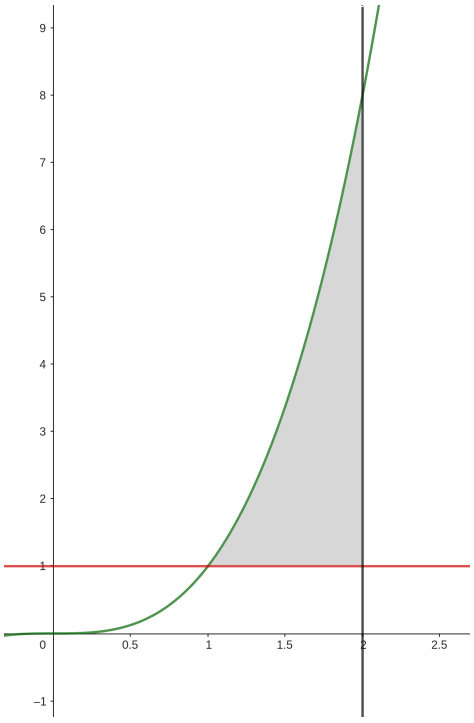
2. Evaluate the integral. Do one and only one of the following.

(a) $\displaystyle\int \sqrt{\frac{1+x}{1-x}} \, dx$ (b) $\displaystyle\int \sqrt{x - x^2} \, dx$

3. Evaluate the integral.

$$\int \sin^2(x) \sin(2x) \, dx$$

4. Find the volume of the solid obtained by rotating the region bounded by $y = x^3$, $y = 1$, and $x = 2$, about the line $y = -3$.



5. Find the exact length of the curve, $y = \ln(1 - x^2)$, $0 \leq x \leq \frac{1}{2}$.

6. Test the series for convergence or divergence.

$$\sum_{n=1}^{\infty} \frac{n!}{e^{n^2}}$$

7. Test the series for convergence or divergence.

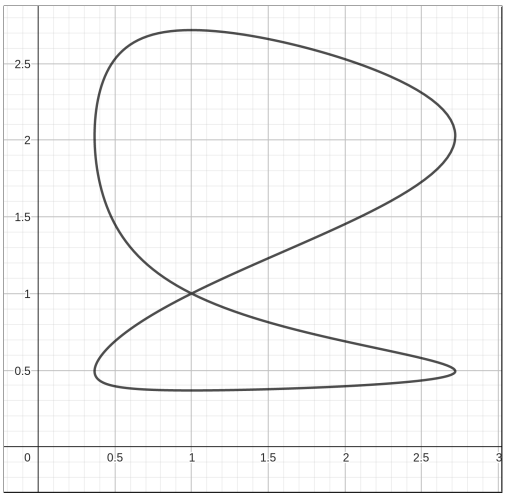
$$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{\sqrt{n}}{n+1}$$

8. Find the radius of convergence and interval of convergence of the power series,

$$\sum_{n=1}^{\infty} \frac{(2x-1)^n}{5^n \sqrt{n}}$$

9. Find the Taylor series for $f(x) = 1/x$ centered at $a = -3$. Also find the associated radius of convergence.

10. For the parametric curve, $(x, y) = \left(e^{\sin(2t)}, e^{\cos(t)}\right)$, $0 \leq t \leq 2\pi$.



   (a) Find $\frac{dx}{dt}$, $\frac{dy}{dt}$, $\frac{dy}{dx}$, and $\frac{d^2y}{dx^2}$.

   (b) Find the exact points on the curve where the tangent line is horizontal or vertical, in terms of both t and (x, y).

   (c) Find the equation of the tangent line to the curve at $t = \pi/3$. Keep your answer in exact form.

   (d) Set up but do not evaluate the integral for the length of this curve.