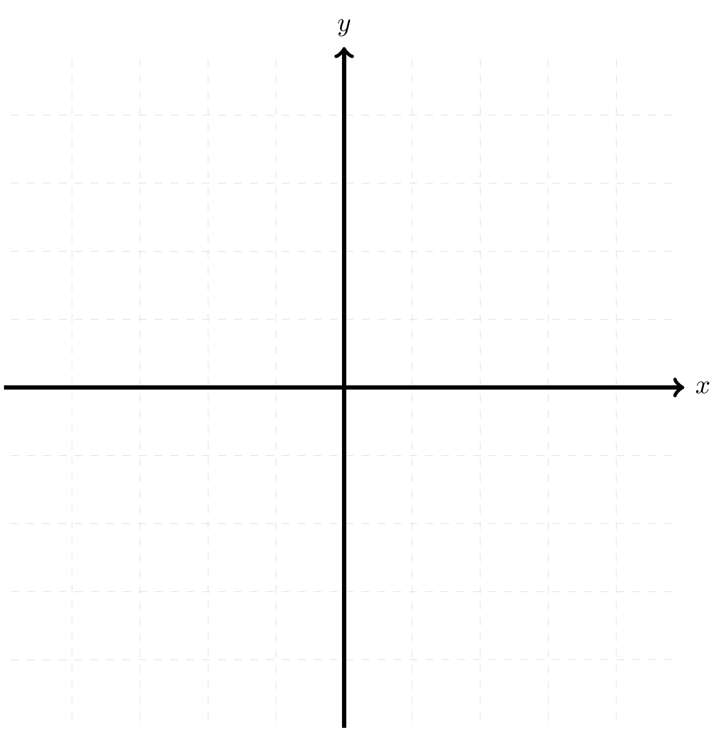
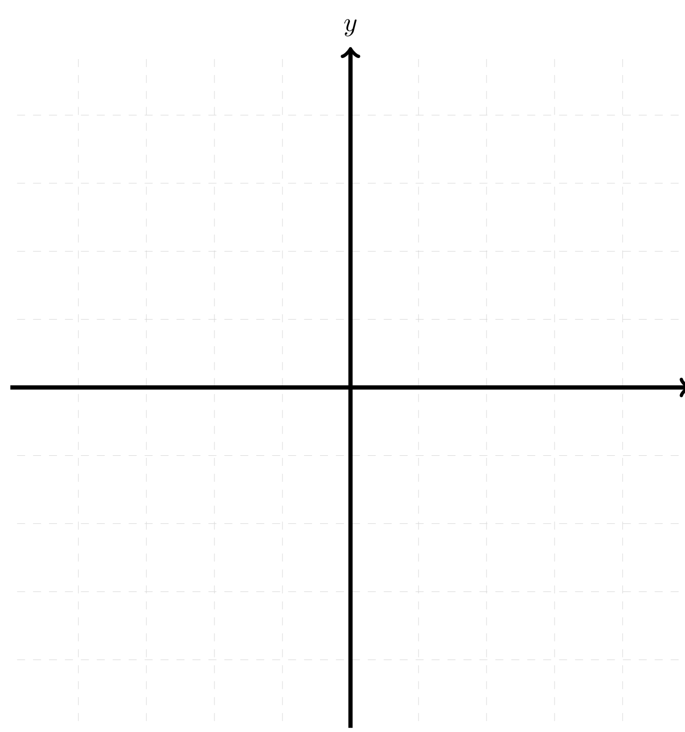
James McKeown's Math 162 exam II review worksheet 11/12/2017
This isn't worth anything and I don't care if you do it or not. It may or may not be similar to exam II.

Suppose the region bounded by the curves $y = x^3$ and $y = x^2$ is rotated about the y-axis. Find the volume of this region in two ways: using disc and washer, and using cylindrical shells. Graph the curves on the both of the plots below Show what a generic disc/washer slice looks like on the left, and what a generic cylindrical shell looks like on the right.





Find the length traced out along the parametric curve $x = \cos(t^4)$, $y = \sin(t^4)$ as t goes through the range $0 \leq t \leq 1$. (Be sure you can explain why your answer is reasonable).

Find the area of the surface obtained by rotating the curve $y = 1 + 3x^2$ from $x = 0$ to $x = 3$ about the y-axis.

Recall that $\frac{e^x}{2} + \frac{-e^{-x}}{2} =: \sinh(x)$. Use this fact to find the Maclaurin series for $\sinh(x)$ and find its radius of convergence.

Take the derivative of what you just did to find the Maclaurin series for $\cosh(x)$. Find its radius of convergence, and check that it equals the Maclaurin series of $\frac{e^x}{2} + \frac{e^{-x}}{2} =: \cosh(x)$

Find the Maclaurin series for the following functions and find their radii of convergence:

$4\tan^{-1}(3x) =$

$\frac{x^3+2x^2-3}{2-x^2} =$

$\frac{\sin(x)}{1-x} =$

Determine whether the following series converge or diverge. State the test you use, and show that all hypothesis for using that test are satisfied!

$$\sum_{n=0}^{\infty} \frac{-5n}{(2n+3)^2}$$

$$\sum_{n=0}^{\infty} \frac{-5n}{(2n+3)}$$

$$\sum_{n=0}^{\infty} \frac{5n}{(2n)^2-3}$$

Find closed formulas for the following sequences:

$a_n = 0, -1, 0, 1, 0, -1, 0, 1, \ldots$

$a_n = 8, 15, 22, 29, 36, 43, \ldots$

$a_n = 4, 7, 16, 31, 52, 79, 112, 151, \ldots$

Find the sum of each of the following series:

$$\sum_{n=3}^{\infty} \frac{1}{3^{n-2}} =$$

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

$$\sum_{n=1}^{\infty} \frac{(-1)^n (\pi)^{2n+1}}{(2n+1)!} =$$