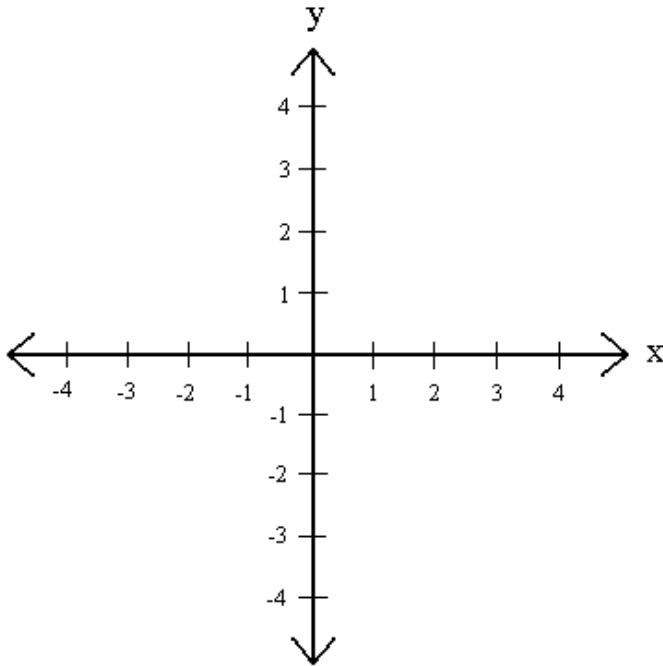




2. Given the equation  $y = \frac{x^2}{x^2-1}$

- a) Find any intercepts and asymptotes of this function's graph (**5 points**)
- b) Find any critical points and determine if it is a relative maximum or minimum using the 2<sup>nd</sup> derivative test. (**6 points**)
- c) Sketch the function using the relevant information from parts (a) through (c) (**5 points**)



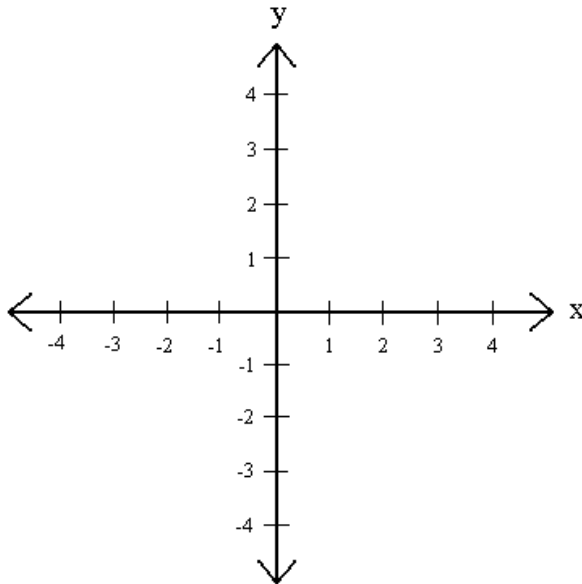
3. For the function  $f(x) = \cos(x/3)$ , find the absolute minimum and maximum values on the following range of  $x$ -values:  $[\pi/2, 4\pi]$ . **(10 points)**

4. Evaluate the indefinite integral (i.e. find the general antiderivative): **(5 points)**

$$\int \left( \frac{x^2 - \sqrt{x}}{x} \right) dx$$

5. Given the function:  $y = x^3 + 6x^2 + 9x$

- a) Find any critical points and determine if it is a relative maximum or minimum using the 2<sup>nd</sup> derivative test. **(5 points)**
- b) Find the intervals for which this function is concave up or concave down **(4 points)**
- c) Sketch the function using the relevant information from parts (a) through (c) **(5 points)**

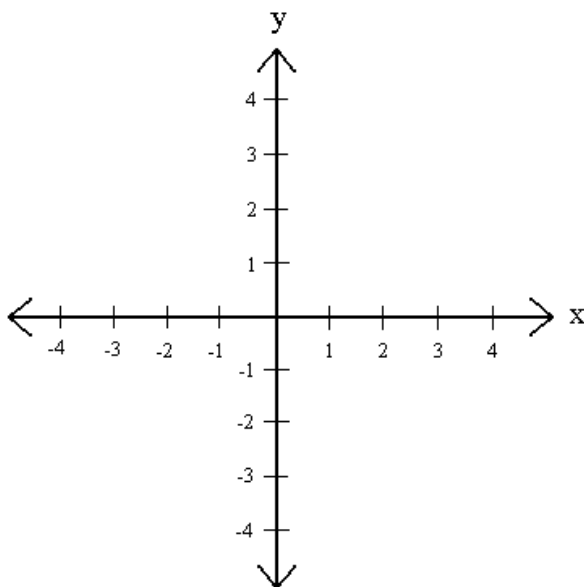


6. Estimate the area under  $f(x)=\sin(x)$  between  $x=0$  and  $x=\pi$  using the right endpoint of 4 rectangles of equal width. Show the graph of the function and your approximating rectangles. **(7 points)**

7. Evaluate the indefinite integral (i.e. find the general antiderivative): **(5 points)**

$$\int(2x^3 - 5x + 7^2 - e^x)dx$$

8. Find the linear approximation of the function  $f(x)=\ln(1+x)$  centered at  $x=0$ . Use this linearization to approximate the value of  $f(0.1)$ . Graph both the linearization and the original function on the set of axis below. **(10 points)**



9. Evaluate the indefinite integral (i.e. find the general antiderivative): **(5 points)**

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

Evaluate the following limits, allowing  $+\infty$  and  $-\infty$  as possible values of a limit. If the limit does not exist, explain why. Show all work. (5 points each)

**Problem 10 this column:**

a.  $\lim_{x \rightarrow 0} \frac{e^x - x - 1}{x^2}$

b.  $\lim_{x \rightarrow \pi/2} \frac{2 \tan(x)}{\sec^2(x)}$

**Problem 11 this column:**

a.  $\lim_{x \rightarrow \infty} \frac{x e^{-3x}}{x^2}$

b.  $\lim_{x \rightarrow \infty} 2x^2 \sin\left(\frac{1}{4x^2}\right)$