MTH129 **Name:** Soln

Practice Exam 2 **Section:**

This exam contains 5 pages (including this cover page) and 6 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books, notes, or any calculator on this exam.

You are required to show your work on each problem on this exam. The following rules apply:

- **Organize your work**, in a reasonably neat and coherent way, in the space provided. Work scattered all over the page without a clear ordering will receive very little credit.
- **Mysterious or unsupported answers will not receive full credit**. A correct answer, unsupported by calculations, explanation, or algebraic work will receive no credit; an incorrect answer supported by substantially correct calculations and explanations might still receive partial credit.
- If you need more space, ask for an extra sheet of paper to continue the problem on; clearly indicate when you have done this.

Do not write in the table to the right.

Problem	Points	Score
1	4	
2	3	
3	3	
4	6	
5	4	
6	5	
Total:	25	

1. (4 points) Consider the rational function

$$f(x) = \frac{x^2 + x - 2}{x^2 + 2x - 3} = \frac{(x+2)(x-1)}{(x-1)(x+3)}$$

a) Find the domain of $f(x)$.

$x \neq 1,\ x \neq -3$

b) Find the vertical asymptotes.

$x = -3$

c) Find the horizontal asymptotes.

$y = 1$

d) Using long division, graph the rational function on the axis below.

$$\frac{(x+2)(x-1)}{(x-1)(x+3)} = \frac{(x+2)}{(x+3)}$$

$$(x+3)\overline{)\,x+2}\quad 1$$

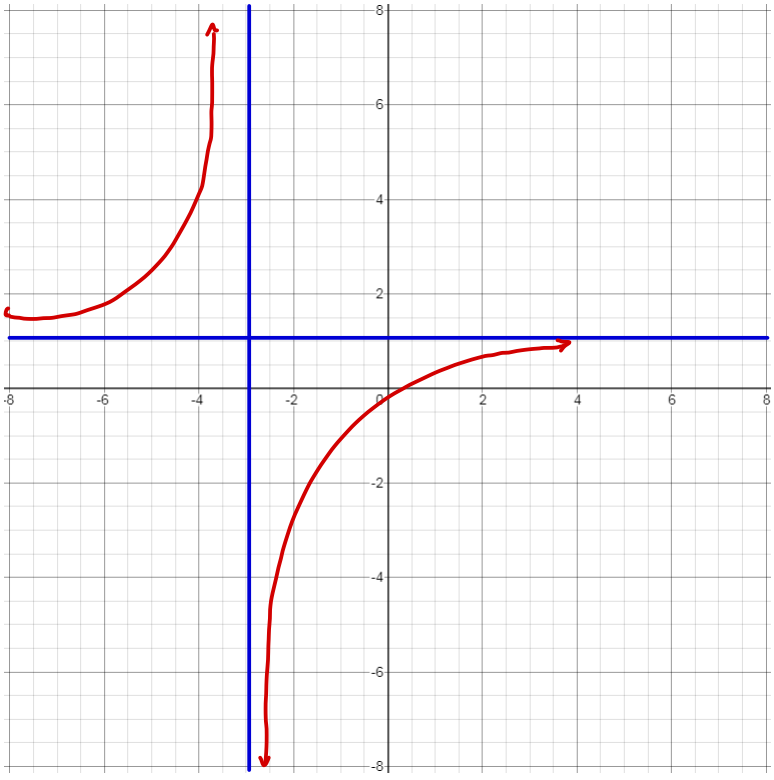
$$-(x+3)$$

$$-1$$

$$\Rightarrow \frac{x+2}{x+3} = 1 - \frac{1}{x+3}$$

shifts $\frac{-1}{x}$ left by 3

and up by 1



2. (3 points) Find algebraic expressions for the inverses of the functions below.

a) $f(x) = \sqrt{x+2}$

$y = \sqrt{x+2} \Rightarrow x = \sqrt{y+2}$

$\Rightarrow x^2 = y+2$

$\Rightarrow y = x^2 - 2$

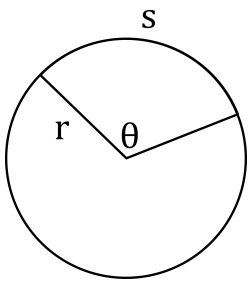
b) $f(x) = 2x + 5$

$y = 2x+5 \Rightarrow x = 2y+5$

$\Rightarrow x-5 = 2y$

$\Rightarrow y = \frac{x-5}{2}$

3. (3 points) Let $r = 5$ and $\theta = 120°$ in the diagram below.



$\theta = 120^\circ = \frac{2\pi}{3}$ radians

a) Find the arclength s.

$S = r\theta = 5\left(\frac{2\pi}{3}\right) = 10\pi/3$

b) Find the area of the sector given by θ.

$A = \frac{1}{2} r^2 \theta = \frac{1}{2} \cdot (5)^2 \left(\frac{2\pi}{3}\right)$

$= \frac{25\pi}{3}$

4. (6 points) The following question concerns logarithms and exponentials.

a) Use the properties of logarithms to simplify the expression so that the result does not contain logarithms of products, quotients, or powers.

$$\ln\left(\frac{3x^8}{(x+1)^5}\right)$$

$\ln\left(\frac{3x^8}{(x+1)^5}\right) = \ln(3x^8) - \ln((x+1)^5)$

$= \ln(3) + \ln(x^8) - \ln((x+1)^5)$

$= \ln(3) + 8\ln(x) - 5\ln(x+1)$

b) Use the properties of logarithms to solve the equation for x.

$$2\ln(x) = \ln 5 + \ln(x+10)$$

$\Rightarrow \ln(x^2) = \ln(5(x+10))$

$\Rightarrow \ln(x^2) = \ln(5x+50)$

$\Rightarrow x^2 = 5x+50$

$\Rightarrow x^2 - 5x - 50 = 0$

$(x+5)(x-10) = 0$

$x = -5$; $x = 10$

Domain.

c) Use the properties of logarithms to solve the equation for x.

$$e^{7x} = 6^{x-4}$$

Note $6 = e^{\ln(6)}$

$\Rightarrow e^{7x} = \left(e^{\ln(6)}\right)^{x-4}$

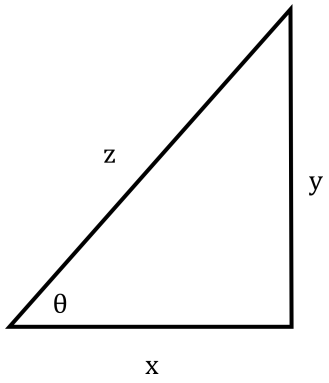
$\Rightarrow e^{7x} = e^{\ln(6)(x-4)}$

$7x = \ln(6)(x-4)$

$7x = \ln(6)x - 4\ln(6)$

$\Rightarrow \frac{4\ln(6)}{\ln(6)-7} = x$

5. (4 points) Consider the diagram below.



a) Given $x = 3$ and $\theta = 30°$ find y.

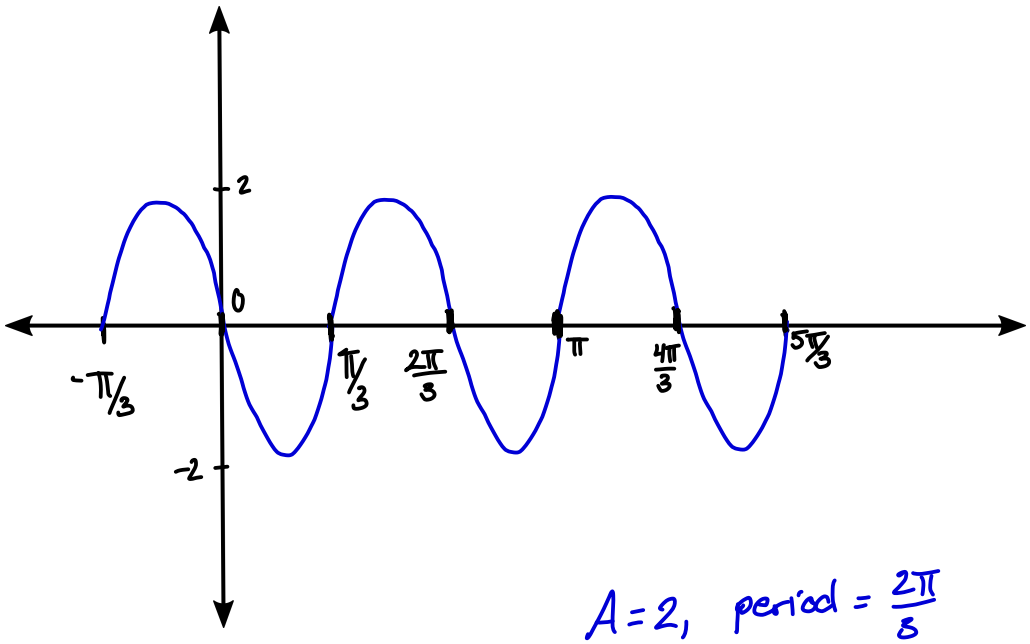
$\tan(30°) = \frac{y}{3} \Rightarrow y = 3\tan(30°) = 3 \cdot \frac{(1/2)}{\frac{\sqrt{3}}{2}} = \frac{3}{\sqrt{3}} = \sqrt{3}$

b) Given $x = 3$, $y = 5$ and $z = 6$ find $\sin(\theta)$, $\cos(\theta)$ and $\tan(\theta)$.

$\sin(\theta) = \frac{5}{6}$; $\cos(\theta) = \frac{3}{6}$; $\tan(\theta) = \frac{5}{3}$

6. (5 points) Graph the following function on the axis below

$$f(\theta) = 2\sin(3\theta + \pi)$$



$A = 2$, period $= \frac{2\pi}{3}$

Shift $= \pi/3$ left