Exercise 1.

a. In Maxima, define the function (which appeared on your mid-term exam):

\[ r(x) = \frac{x^2 - x + 3}{(x^2 + 4)(x + 1)} \]  

(1)

(Recall, to define a function in Maxima, you would type \( r(x) := <\text{enter function here}>; \) – don’t forget the colon before the = sign. Then type shift+enter.) Now type \( r(x) \) in the Maxima command window, hit shift+enter, and make sure Maxima outputs the function you expect. It should look just like (1).

b. Use Maxima’s \texttt{partfrac} command to find the partial fraction expansion of the function \( r(x) \). (If you don’t know about the \texttt{partfrac} command, look it up in the help index. You can also try \texttt{describe(partfrac)} or \texttt{example(partfrac)}.)

Answer: ____________________________

c. Let’s name the partial fraction expansion of \( r(x) \) something else, like \( s(x) \). Define \( s(x) \) by entering \( s(x) := \texttt{partfrac}(r(x),x); \) (Of course, \( r(x) \) and \( s(x) \) are just two representations of the same function.) Now, just to be sure, type \( s(x) \), hit shift+enter and check that you and Maxima agree on what \( s(x) \) should be.

d. Finally, use Maxima’s \texttt{ratsimp} command to get the “simplest” form of the function \( s(x) \).

Answer: ____________________________

e. Does the representation you found in part d. look the same as our original representation in (1)? Why or why not? Answer:
Exercise 2.

a. Find out the Maxima names for the inverse trigonometric functions. Write down Maxima’s name for the function \( \arctan(x) \).

Answer: __________________________

b. Plot the inverse tangent function using Maxima’s Plot 2D button (or select Plot 2d from the drop-down Plot menu).

c. Using Maxima, compute the derivative of \( \arctan(x) \).

Answer: __________________________

...and write down the Maxima command (as it appears in the Maxima window) that was used to differentiate \( \arctan(x) \).

Command Used: __________________________

Exercise 3. Use Maxima to compute the following integrals:

a. \( \int \sin \sqrt{x} \, dx \)

Answer: __________________________ Command Used: __________________________

b. \( \int \tan^3 x \, dx \)

Answer: __________________________

c. \( \int \frac{\sqrt{x^2+9}}{x^4} \, dx \)

Answer: __________________________