1. (10 Points) The following exercises all deal with the curve, \(2(x^2 + y^2)^2 = 25(x^2 - y^2)\).

(a) Find all the points on the curve where \(x = 2\). Keep your answers in exact form.

**Solution:** \(\left(2, -\sqrt{-\frac{41}{4} + \frac{5\sqrt{89}}{4}}\right)\) and \(\left(2, \sqrt{-\frac{41}{4} + \frac{5\sqrt{89}}{4}}\right)\)

(b) Find the equation of the tangent line to the curve at each point where \(x = 2\). Use approximations to the numbers to at least 7 decimal places.

**Solution:**

\[-1.2419647398 - 0.0966176866(-2 + x) = -1.0487293666 - 0.0966176866x\]
and
\[1.2419647398 + 0.0966176866(-2 + x) = 1.0487293666 + 0.0966176866x\]

2. (15 Points) The following exercises all deal with the curve, \(f(x) = \frac{x^2}{x^3 + 1}\).

(a) Plot the function in the window \(-5 \leq x \leq 5\) and \(-1 \leq y \leq 1\). Draw the graph below.

**Solution:**

(b) From the graph how many tangent lines to the graph pass through the point \((0, -0.5)\)?

**Solution:** 2

(c) Use Mathematica to find the \(x\) values of the point of tangency for each tangent line that passes through the point \((0, -0.5)\). Use approximations to the numbers to at least 7 decimal places.

**Solution:** \(x = -4.143767165125244\) and \(x = -0.5290889397976927\). The commands used here were \(f[x_] := x^2/(x^3 + 1)\) and \(NSolve[f'[a] (0 - a) + f[a] == -1/2, a]\).