PROBLEM SET 8: ARC LENGTH

Note: Most of the problems were taken from the textbook [1].

Problem 1. *Find the length of the following curve in the specified intervals.*

a) $y = 1 + 6x^{3/2}, \quad 0 \le x \le 1$;

b) $x = \frac{y^4}{8} + \frac{1}{4y^2}, \quad 1 \le y \le 2$;

c) $x = \frac{1}{3}\sqrt{y}(y-3), \quad 1 \le y \le 9$;

d) $y = \ln(\cos x), \quad 0 \le x \le \pi/3$;

e) $y = \frac{x^2}{4} - \frac{1}{2}\ln x, \quad 1 \le x \le 2$;

f) $y = \sqrt{x - x^2} + \sin^{-1}\sqrt{x}, \quad 0 \le x \le 1/2$;

g) $y = \ln(1 - x^2), \quad 0 \le x \le 1/2$.

Problem 2. *Find the arc length function for the curve* $y = \sin^{-1} x + \sqrt{1 - x^2}$ *with starting point* $(0, 1)$.

Problem 3. *For the function* $f(x) = \frac{1}{4}e^x - e^{-x}$, *show that the arc length on any interval has the same value as the area under the curve.*

References

[1] J. Stewart: *Single Variable Calculus* 8th Edition, Cengage Learning, Boston 2015.