1. Evaluate
\[ \lim_{t \to 0} \frac{1}{t} \left( \tan^{-1} \left( \frac{1}{x + t} \right) - \tan^{-1} \left( \frac{1}{x} \right) \right) \]

2. Find the minimum value of \( e^x - x - \frac{x^3}{3} \).

3. Given \( \int_{-\infty}^{\infty} e^{tx} f(x) dx = \sin^{-1} \left( t - \sqrt{1/2} \right) \), find \( \int_{-\infty}^{\infty} x f(x) dx \).

4. Find the values of \( x \) that maximize \( f(x) = \left| \frac{3x + 1}{9x^2 + 6x + 2} \right| \).

5. A rectangular pyramid tower is being built on a circular island of radius two. The height of the tower is equal to its width. What is the maximum volume of the tower?

6. Evaluate
\[ \sum_{k=0}^{\infty} ke^{-\frac{13k}{k!}}. \]

7. Calculate \( \frac{d}{dt} \left[ \int_{-\ln 1/t}^{\ln 1/t} \cos(te^x) dx \right] \).

8. Evaluate
\[ \frac{1}{1} + \frac{1}{2} - \frac{2}{3} + \frac{1}{4} + \frac{1}{5} - \frac{2}{6} + \frac{1}{7} + \frac{1}{8} - \frac{2}{9} + \cdots \]

9. Find the value of \( k \) which minimizes
\[ F(k) = \int_{0}^{4} |x(4 - x) - k| \, dx. \]

10. Let \( f(x) = x^6 - 6x^2 + 6x - 7 \). It is known that this polynomial has three critical points. Find the parabola passing through these critical points.