Name: **Tutorial time:**

1. Evaluate the following limits:

   (a) $\lim_{x\to 2} \dfrac{2-\sqrt{x+2}}{x-2}$

   (b) $\lim_{\theta\to 0} \dfrac{\tan\theta}{\sin\theta + 2\theta}$

   (c) $\lim_{x\to 0} x^2 \cos\left(\dfrac{1}{x^2}\right)$ (Hint: squeeze theorem)

   (d) $\lim_{x\to 2^+} \dfrac{x^2-9}{x^2-4}$.

2. Let $f(x) = \dfrac{x^2 - 4}{x^2 - 4x + 3}$.

   (a) What is the horizontal asymptote for the graph $y = f(x)$?

   (b) What are the vertical asymptotes for the graph $y = f(x)$?

   (c) What are the left and right-hand limits of $f(x)$ at each vertical asymptote?

3. Find and classify the discontinuities of $f(x) = \begin{cases} \frac{x^2+2x+1}{x+1}, & \text{if } x \leq 0 \\ \frac{1}{x-2}, & \text{if } x > 0 \end{cases}$

4. Using the **definition** of the derivative, find the equation of the tangent line to $y = x^2 + 1$ at the point $(1, 2)$.