1. **(6 points)** Compute the following infinite limits, or, if the limit is uncomputable, briefly describe (in symbols or words) the relevant long-term behavior of the function.

   (a) **(2 points)** $\lim_{x\to-\infty} \frac{4x^3+6x^2-2}{2x^3-4x+5}$

   (b) **(2 points)** $\lim_{t\to+\infty} \frac{(t-2)(t+5)}{t^2(2t-6)}$

   (c) **(2 points)** $\lim_{r\to-\infty} \frac{2-r^3}{r^2+2r+1}$

2. **(4 points)** *Using the difference quotient*, find the derivative of the function $f(x) = 4x^2 - 5x$.

3. **(4 points)** *If* $g(t) = 6t^3 - \frac{1}{\sqrt{t}} + 6e^t$, *compute* $g''(t)$.

4. **(6 points)** Perform the following computations; you do not need to algebraically simplify fully differentiated expressions.

   (a) **(3 points)** Determine $\frac{d}{ds}\frac{s^3-3s}{5s^2-e^s}$

   (b) **(3 points)** If $y = (t^e + e^t)\left(3\sqrt{t} - \frac{1}{t^3}\right)$, find $\frac{dy}{dt}$.

5. **(2 point bonus)** If $f(x) = x^2e^x$, find (with justification) a general formula for $f^{(n)}(x)$ on the back of this page.