

1. **(4 points)** Given $f(x) = 6x + 1$, use the *difference quotient* to calculate $f'(x)$.
2. **(4 points)** Determine the values of the following limits if possible; if they can not be evaluated, explain why.

(a) **(2 points)** $\lim_{u \rightarrow +\infty} \frac{7u^2 - 3}{u^4 + u}$

(b) **(2 points)** $\lim_{t \rightarrow -\infty} \frac{t^6 + 3t^2 - 100}{2t^6 + t^3}$

3. **(4 points)** Calculate $\frac{d}{dx} \left(\frac{7}{x^2} - 5 + 3\sqrt{x} \right)$.

4. **(8 points)** Solve the problems given below.

(a) **(4 points)** Find $\frac{d}{dt} (t^3 e^t)$.

(b) **(4 points)** Given $g(x) = \frac{x^2 - 3x}{2x^3 - 1}$, find $g'(x)$.

5. **(2 point bonus)** Determine $\frac{d^4}{dx^4} (x^2 e^x)$.