MATH 2310 Practice Test 1

1. Compute the limits

   (a) $\lim_{x\to 2} x^3 + 1$

   (b) $\lim_{x\to 2} \frac{x^2 - 2}{x^2 + 2}$

   (c) $\lim_{x\to 2} \frac{x^2 - 2x + 1}{x^2 - 2}$

   (d) $\lim_{x\to 0} \frac{\sin(3x)}{3x}$

   (e) $\lim_{x\to 0} \frac{\sin(3x)}{x}$

   (f) $\lim_{x\to 0} \frac{\sin(x)}{3x}$

   (g) $\lim_{n\to\infty} \frac{4n^2 + 5}{3n^2 + 6n - 5}$

   (h) $\lim_{n\to\infty} \frac{n^2}{n^3 + 1}$

   (i) $\lim_{n\to\infty} \frac{n^3}{n^2 + 1}$

   (j) $\lim_{n\to -\infty} \frac{n^5}{n^3 + 1}$

   (k) $\lim_{n\to -\infty} \frac{n^3}{n^2 + 1}$

   (l) $\lim_{n\to\infty} \sqrt{2n+1}\frac{3n + 2}{\sqrt{4n^3 + n + 11}}$

   (m) $\lim_{x\to 0^+} \frac{1}{3x}$

   (n) $\lim_{x\to 0^-} \frac{1}{3x}$

   (o) $\lim_{x\to 0} \frac{1}{3x}$

   (p) $\lim_{x\to 0^+} \frac{1}{x^2}$

   (q) $\lim_{x\to 0^-} \frac{1}{x^2}$

(r) $\lim_{x \to 0} \dfrac{1}{x^2}$

(s) $\lim_{x\to 1} \frac{x+1}{x^2-1}$

2. Compute the derivative using the **definition** of the derivative

(a) $f(x) = 3x + 5$ at $x = -1$

(b) $f(x) = x^2$ at $x = 2$

(c) $f(x) = x^2$

(d) $f(x) = 5x + 1$

(e) $f(x) = \sqrt{x}$

(f) $f(x) = \frac{1}{x}$

3. Compute the derivative from the formulae.

(a) $f(x) = 3x + 5\sqrt{x} - \sin(x)$

(b) $f(x) = 5\cos(x) - 4\ln(x) + \sin(x)$

(c) $f(x) = \frac{1}{x} - \sqrt{x}$

(d) $f(x) = \frac{4-2x+2x^2}{\sqrt{x}}$

(e) $f(x) = \frac{4\sqrt{x}-2+x^{3/2}}{\sqrt{x}}$

(f) $f(x) = \frac{4\sqrt{x}-2}{x^{3/2}}$

(g) $f(x) = \sin(x) - 2e^x + \ln(x)$

4. Compute the derivative from the formulae and use product rule and the power rule.

(a) $f(x) = 5\sqrt{x}\sin(x)$

(b) $f(x) = 5\cos(x)\sin(x)$

(c) $f(x) = 4\ln(x)\cos(x)$

(d) $f(x) = \ln(x)$

(e) $f(x) = (\ln(x) + 7x)^3$

(f) $f(x) = (3x + 2)^3$

(g) $f(x) = (3x^3 + 2)^3$

(h) $f(x) = \sqrt{3x^3 + 2}$

(i) $f(x) = (x - 1)^4(3x + 2)^3$

(j) $f(x) = e^x(1 + e^x)^{-2}$

(k) $f(x) = (\sin(x))^{-1}$

(l) $f(x) = (\cos(x))^{-1}$