Due: August 16, 2023

1. For the following equations find dy/dx:
   a) $y = (x^2 + 2x + 3)^2$ (check by multiplying out and then differentiating)
   b) $y = (\frac{x^3}{3} + 1)^5 + (\frac{x^2}{2} + 1)^4 + 3$
   c) $y = [(x^2 + 1)^{10} + 1]^8$
   d) $y = \frac{[(x^3+7)^4+x]^5}{x^2+1}$

2. Find the derivatives y' using the extended power rule:
   a) $y = x^{3/4} + x^{4/3}$
   b) $y = 1/\sqrt{x}$
   c) $y = 1/\sqrt[3]{2x - 3}$

3. Find $\partial y/\partial x_1$ and $\partial y/\partial x_2$ for each of the following functions
   a) $y = 7x_1 + 5x_1x_2^2 - 9x_2^3$
   b) $y = \frac{4x_1+3}{x_2-2}$

4. Find $\partial f/\partial x$ and $\partial f/\partial y$ for each of the following
   a) $f(x, y) = x^2 - 5xy - y^3$
   b) $f(x, y) = (x^2 - 3y)(x - 2)$

5. Find the second and third derivatives of the following functions:
   a) $6x^4 - 3x - 4$
   b) $\frac{1+x}{1-x}$ and $(x \neq 1)$
   c) $-16x^3 + 12x^2 + 4x$

6. Given $q = \frac{(v+2)^3-8}{v}$ and $(v \neq 0)$, find
   a) $\lim_{v\to 0} q$
   b) $\lim_{v\to 2} q$

7. Compute the following limits:

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

b) $\lim_{x\to\infty} \frac{x^2}{(x^2+1)}$

c) $\lim_{x\to\infty} \frac{x^4}{(x^2+1)}$

d) $\lim_{x\to 8+} \frac{5}{(x-8)}$

e) $\lim_{x\to 8-} \frac{-5}{(x-8)}$