Homework No. 5 – October 18, 2017

Exercise 1. Find the derivative of the functions.

(1) $y = -x^2 + 3$

(2) $y = x^2 + x + 8$

(3) $s = 5t^3 - 3t^5$

(4) $w = 3z^7 - 7z^3 + 21z^2$

(5) $y = \frac{4x^3}{3} - x$

(6) $y = \frac{x^3}{3} + \frac{x^2}{2} + \frac{x}{4}$

(7) $w = 3z^{-2} - \frac{1}{z}$

(8) $s = -2t^{-1} + \frac{4}{t^2}$

(9) $y = 6x^2 - 10x - 5x^{-2}$

(10) $y = 4 - 2x - x^{-3}$

(11) $r = \frac{1}{3s^2} - \frac{5}{2s}$

(12) $r = \frac{12}{\theta} - \frac{4}{\theta^3} + \frac{1}{\theta^4}$

(13) $y = (3 - x^2)(x^3 - x + 1)$

(14) $y = (x - 1)(x^2 + x + 1)$

(15) $y = (x^2 + 1)\left(x + 5 + \frac{1}{x}\right)$

(16) $y = \left(x + \frac{1}{x}\right)\left(x - \frac{1}{x} + 1\right)$

(17) $y = \frac{2x+5}{3x-2}$

(18) $z = \frac{2x+1}{x^2+1}$

(19) $g(x) = \frac{x^2-4}{x+0.5}$

(20) $f(t) = \frac{t^2-1}{t^2+t-2}$

(21) $v = (1 - t)(1 + t^2)^{-1}$

(22) $w = (2x - 7)^{-1}(x + 5)$

(23) $f(s) = \frac{\sqrt{s}-1}{\sqrt{s}+1}$

(24) $u = \frac{5x+1}{2\sqrt{x}}$

(25) $v = \frac{1+x-4\sqrt{x}}{x}$

(26) $r = 2\left(\frac{1}{\sqrt{\theta}} + \sqrt{\theta}\right)$

(27) $y = \frac{1}{(x^2-1)(x^2+x+1)}$

(28) $y = \frac{(x+1)(x+2)}{(x-1)(x-2)}$

(29) $y = \frac{x^3+7}{x}$

(30) $y = \frac{(x-1)(x^2+x+1)}{x^3}$

(31) $w = \left(\frac{1+3z}{3z}\right)(3 - z)$

Exercise 2. Write the following functions in the form $f(g(x))$, then find $\frac{dy}{dx}$ as a function of x.

(a) $y = (2x + 1)^5$

(b) $y = (4 - 3x)^9$

(c) $y = \left(1 - \frac{x}{7}\right)^{-7}$

(d) $y = \left(\frac{x}{2} - 1\right)^{-10}$

(e) $y = \left(\frac{x^2}{8} + x - \frac{1}{x}\right)^4$

(f) $y = \left(\frac{x}{5} + \frac{1}{5x}\right)^5$

Exercise 3. Find the derivatives of the following functions.

(a) $p = \sqrt{3 - t}$

(b) $q = \sqrt{2r - r^2}$

(c) $y = \frac{1}{21}(3x - 2)^7 + \left(4 - \frac{1}{4x^2}\right)^{-1}$

(d) $y = (5 - 2x)^{-3} + \frac{1}{8}\left(\frac{2}{x} + 1\right)^4$

(e) $y = (4x + 3)^4(x + 1)^{-3}$

(f) $y = (2x - 5)^{-1}(x^2 - 5x)^6$

Exercise 4. Find the absolute maximum and minimum values of the following functions on the given intervals.

(a) $f(x) = \frac{2}{3}x - 5, \quad -2 \le x \le 3$

(b) $f(x) = -x - 4, \quad -4 \le x \le 1$

(c) $f(x) = x^2 - 1, \quad -1 \le x \le 2$

(d) $f(x) = 4 - x^2, \quad -3 \le x \le 1$

(e) $f(x) = -\frac{1}{x^2}, \qquad 0.5 \leq x \leq 2$

(f) $f(x) = -\frac{1}{x}, \qquad -2 \leq x \leq -1$

(g) $f(x) = \sqrt[3]{x}, \qquad -1 \leq x \leq 8$

(h) $f(x) = -3x^{2/3}, \qquad -1 \leq x \leq 1$

(i) $f(x) = \sqrt{4 - x^2}, \qquad -2 \leq x \leq 1$

(j) $f(x) = -\sqrt{5 - x^2}, \qquad -\sqrt{5} \leq x \leq 0$