MA122 In-class Practice Problem Set 3

(1) Degrees and Radians:

(a) Convert 90° to radians.
Answer: $\frac{\pi}{2}$ rad

(b) Convert $\frac{\pi}{3}$ rad to degrees.
Answer: 60°

(2) Find the derivatives of $f(x)$:

(a) $f(x) = \sin(e^x)$
Answer: $\cos(e^x)e^x$

(b) $f(x) = \cos(x^2)$
Answer: $-2x\sin(x^2)$

(c) $f(x) = \tan^2(e^x)$
Answer: $2e^x \tan(e^x)\sec^2(e^x)$

(d) $f(x) = \cot^4(x^2)$
Answer: $-8x\cot^3(x^2)\csc^2(x^2)$

(3) A soft-drink company has revenues from sales over a 2-year period as given approximately by

$$R(t) = 4 - 3\cos\left(\frac{\pi t}{6}\right) \quad 0 \le t \le 24$$

where $R(t)$ is revenue (in millions of dollars) for a month of sales t months after February 1.

(a) What is the rate of change of revenue t months after February 1?
Answer: $R'(t) = \frac{\pi}{2}\sin\left(\frac{\pi t}{6}\right)$

(b) What is the rate of change of revenue 6 months after February 1?
Answer: 0

(c) Find all local maxima and minima for $0 < t < 24$.
Answer: local maximum is 7, obtained at $t = 6, 18$; local minimum is 1, obtained at $t = 12$

(d) Find the absolute maxima and minima for $0 < t < 24$.
Answer: absolute maximum is 7, absolute minimum is 1.