Practice Set

1. Differentiate the following functions.

   (a) $y = \sqrt{13x^2 - 5x + 8}$

   (f) $y = \cos(4x) - \tan(x^2 + \sin x)$

   (b) $y = (1 - 4x + 7x^5)^{2016} + (\sqrt{x} + x)^{2017}$

   (c) $y = \cos(x^2 e^x) + \cos x$

   (d) $y = x^2 \cos(\frac{1}{x^3}) + \dfrac{1}{x}$

   (e) $y = 3 \tan \sqrt{x} + xe^{-x}$

   (f) $y = \left(\dfrac{8x - x^6}{x^3}\right)^{-\frac{4}{5}}$

2. Differentiate the following functions and evaluate their derivative at the given points for the specified functions. (You may apply chain rule twice).

   (a) $y = \cos^2(x^3) \qquad x = \sqrt[3]{\dfrac{4\pi}{3}}$

   (b) $y = \tan^4(z^2 - \pi) \qquad z = \sqrt{\frac{\pi}{6}}$

   (c) $y = \sin^3(e^{1-t} + 3\sin(6t)) \qquad t = 1$

   (d) $y = x^{-2} \sin^2(x^3)$

   (e) $y = (3 + \cos^3(3x))^{-\frac{1}{3}}$

   (f) $y = \cos\left(\dfrac{1 - e^{2x}}{1 + e^{2x}}\right) \qquad x = 0$

3. Find the tangent line to $f(x) = 4\sqrt{2x} - 6e^{2-x}$ at $x = 2$.

4. Find the point(s) where the tangent line to the graph of $h(t) = e^{5t^2+7t-13}$ is parallel to the line $y = -5$.

5. Find the point(s) where the tangent line to the graph of $g(x) = \sqrt{\dfrac{x^2 + x}{x^2}}$ is horizontal.

6. Find the point(s) where the tangent line to the curve of the function $y = e^{\tan x}$ is parallel to the line $y + 3x = 4$

7. Assume that $h(x) = f(g(x))$, where both f and g are differentiable functions. If $g(-1) = 2$, $g'(-1) = 3$, and $f'(2) = -4$, what is the value of $h'(-1)$?

8. Assume that $h(x) = (f(x)^3)$, where f is a differentiable function. If $f(0) = -\frac{1}{2}$ and $f'(0) = \frac{8}{3}$, determine an equation of the line tangent to the graph of h at $x = 0$.