1.2 Review

(1) Draw a graph on a grid (as in homework problems 1 and 3) with a point P at which the graph has slope 0, and where the graph does not have slope zero for any other point besides P. Do the same for slopes $\frac{3}{4}$ and -2.

(2) Find the points on the graph of $y = x^3$ where the tangent line is parallel to the line $-3x + 4y = 12$.

1.3

(1) Differentiate the following:
   (a) x^4
   (b) $\frac{1}{\sqrt{x^3}}$
   (c) x^{-2}
   (d) $x^{\frac{1}{3}}$

(2) Find the equation of the tangent line to the graph of $f(x) = \frac{1}{x^{\frac{3}{2}}}$ at $\left(4, \frac{1}{8}\right)$.

(3) Let $f(x) = x^3 + 2x$. Calculate $f'(x)$ using difference quotients, i.e.

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

(4) Is there any point where the tangent line to the graph of $f(x) = x^3 + 2x$ is horizontal? Why or why not?

1.4

(1) Determine whether the following limit exists. If so, calculate it.
   (a) $\lim_{x \to 2} \frac{x^2-4}{x-2}$
   (b) $\lim_{x \to -1} x + \frac{1}{x+1}$
   (c) $\lim_{x \to 5} \frac{1}{x} + \sqrt{x-6}$
   (d) $\lim_{x \to -3} \frac{2x}{\sqrt{x+3}-1}$

(2) Use the limit of the difference quotient to compute $f'(1)$.
   (a) $f(x) = 2x^3 + 3x + 1$
   (b) $f(x) = \frac{1}{x^2}$

(3) Use the limit of the difference quotient to compute the following derivatives.
   (a) $f(x) = \frac{x^2}{x^2+1}$
   (b) $f(x) = 5 - 3x + \sqrt{x}$
   (c) $f(x) = \sqrt{x^2 + x}$
   (d) $f(x) = 2x + 4$