1. **(<u>C5.4 - N</u>) (CI)** Determine the equations of the specified lines that are *tangent* and *normal* to the following functions at the specified points. (Reminder: a ***normal line*** is perpendicular to a ***tangent line***)
(Cirrito 20.1, p.646)
    a. $g(x) = x^2 + 3x$ at the point where $x = 2$.
    b. $f(x) = \frac{1}{2}\sqrt{x}$ at the point where $x = 4$.
    c. $h(x) = x - \frac{1}{x}$ at the point where $x = -1$.
    d. $k(x) = \frac{5}{x^2} + \frac{1}{\sqrt{x}}$ at the point where $x = 1$

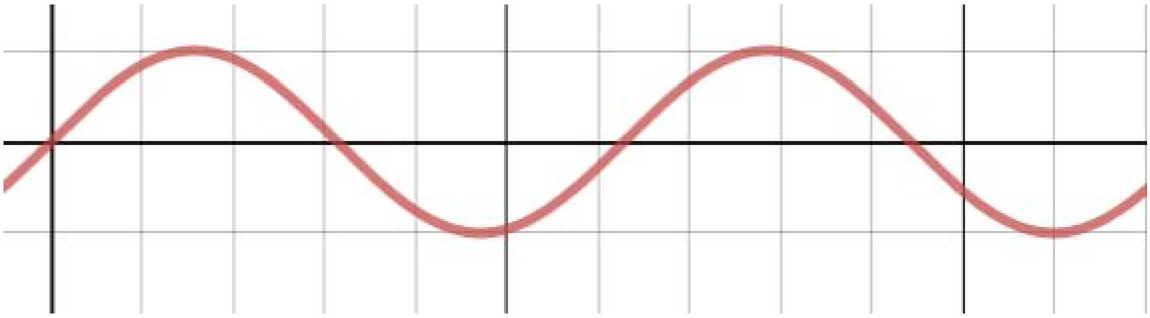
2. **(<u>C5.4 - N</u>) (CI)** At what x value(s) does the curve $y = \frac{1}{2}x^4 + \frac{4}{3}x^3 - x^2 - 6x + 7$ have a tangent line that is perpendicular to the line 2y - x + 6 = 0?
(Cirrito 20.1, p.646)

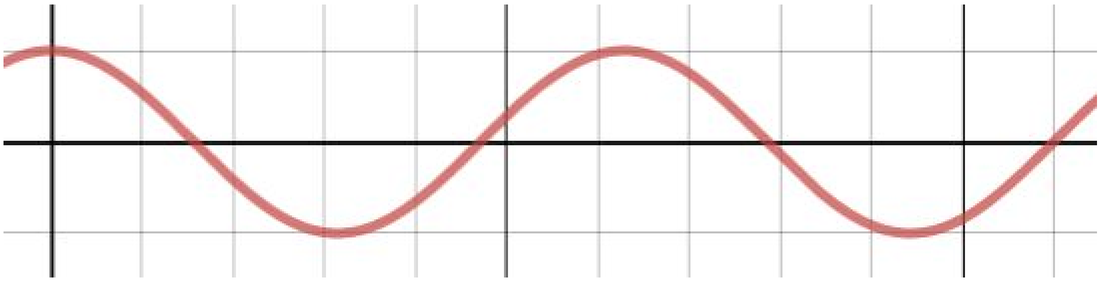
3. **(<u>C5.4 - N</u>) (CI)** Determine the value of the constant k so that the line $y = 4x - 1$ is tangent to the parabola $y = x^2 + k$.
(Cirrito 20.1, p.646)

4. **(<u>C5.4 - N</u>) (CI)** Find the equation(s) of the tangent(s) to the curve $y = x^2 + x$ that pass through the point (2,2). Illustrate your answer with a sketch.
(Cirrito 20.1, p.646)

5. **(<u>C5.4 - N</u>) (CI)** A tangent line is drawn from the point (-3,2) to the curve $y = 2\sqrt{x}$. Find all possible points of tangency. Illustrate your answer with a sketch.
(Cirrito 20.1, p.646)

6. **(<u>C5.7 - N</u>) (CI)** Here are two graphs of functions. Sketch graphs of the ***first*** derivatives of each function. Record any observations/conclusions you might make about the two functions and their derivatives.
(Cirrito 19.2, p.60)

a. 

b. 

7. **(<u>C5.4 - N</u>) (CI)** For the following functions, use the first and second derivatives to determine (i) the extrema, (ii) the intervals of increase and decrease, (iii) the inflection points and (iv) the intervals of concavity and then sketch the functions.

   a. $g(x) = x^4 - 6x^2 - 27$
   b. $h(x) = x^3 - x^2 - x + 1$ on the interval [-2,3]
   c. $f(x) = \frac{1}{4}x^4 - x^3 - 1$