![list icon] **Unit 2A Assignment**

Work slowly and carefully. If you are having difficulty, go back and review the appropriate *Lesson*.

As your midterm and final exams do not allow calculators, it is best to attempt all questions in this *Assignment* without a calculator.

Be sure to proofread your assignment carefully.

For full marks, show all calculations, steps, and/or explain your answers.

Total: 61 marks.

(2)   1.   Determine the slope of the secant line passing through the curve $y = \dfrac{1}{x}$ at $x = 1$ and $x = 3$. Sketch a graph to support the solution.
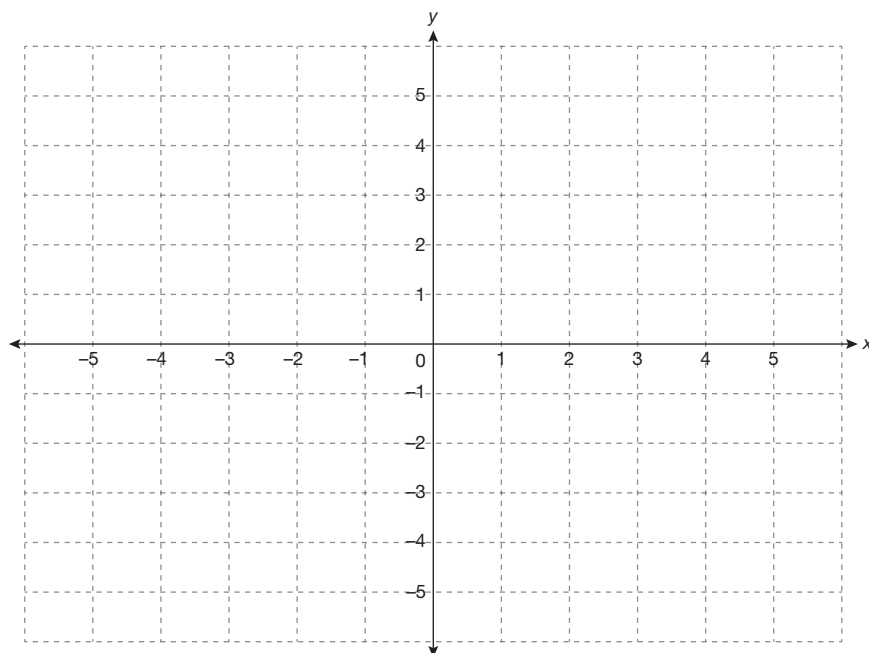
(3)　2.　a.　Using the slope formula, show the expression for the slope of the secant line through $y = x^2 - 4x$ at $x = 3$ and $x = 3 + h$ is $m = h + 2$.

(3)

b. Sketch the graph of $y = x^2 - 4x$ along with three distinct secant lines passing through the curve at $x = 3$. The sequence of secant lines should approach tangency at $x = 3$. In other words, in the expression for the slope of the secant line in part a., h should approach 0.

Hint: h is the horizontal distance between x_1 and x_2. Consider starting with $h = 1$.
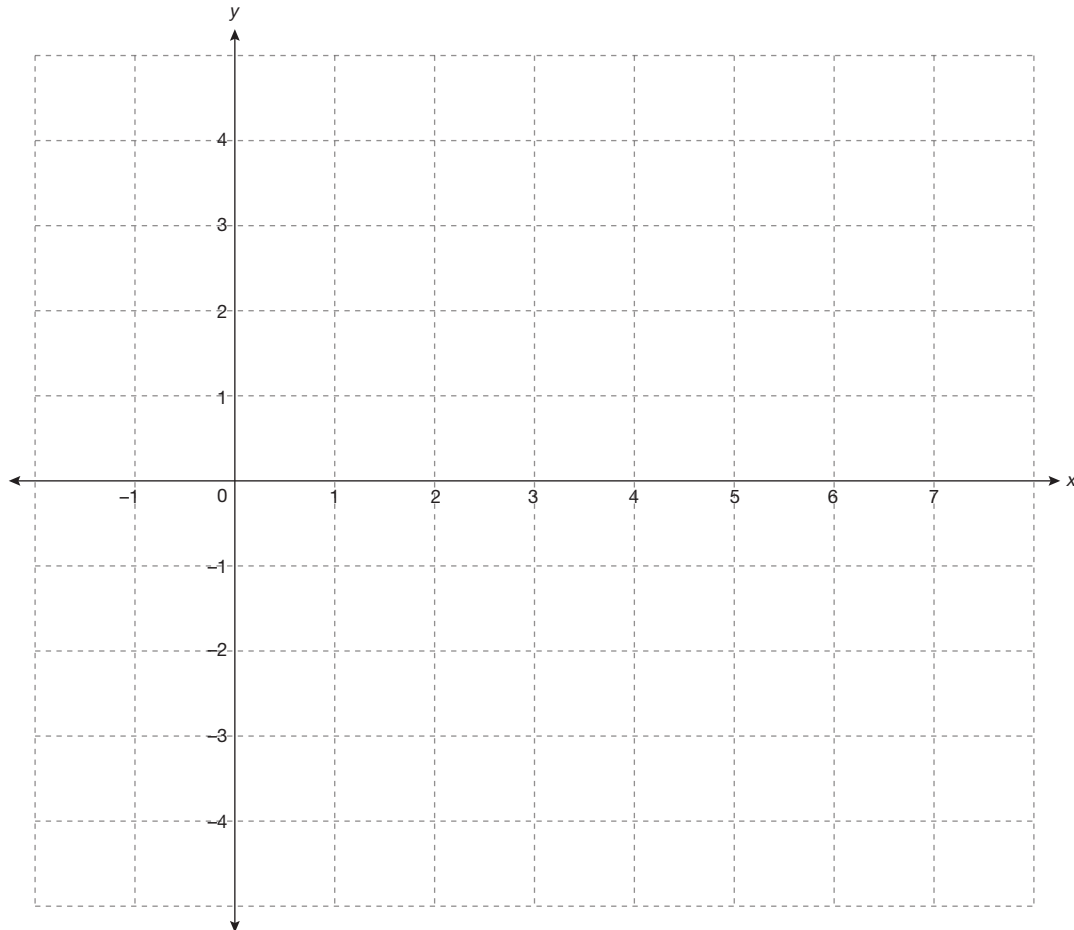
(2)

c. Estimate the slope of $y = x^2 - 4x$ at $x = 3$. Justify the estimate.

(3)   3.   Using first principles, find the derivative of $y = x^2 - 1$.
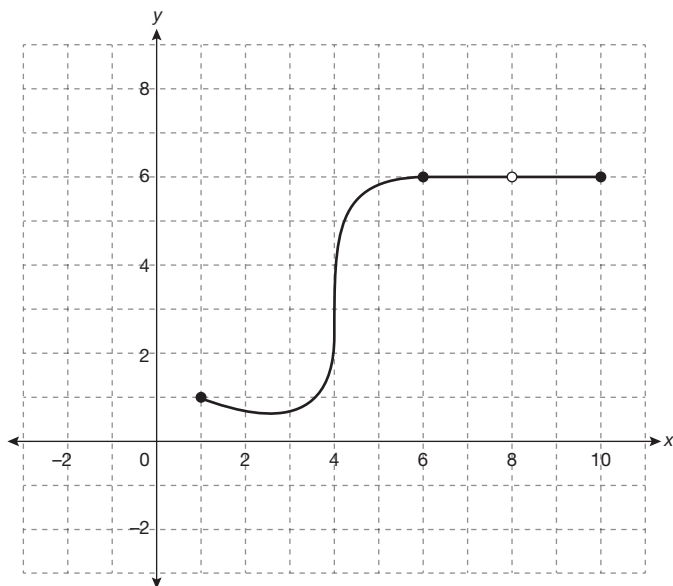
(4)   4.   Find the slope of the function $f(x) = \sqrt{x + 4}$ at the point $(5, 3)$ using first principles.

(4)   5.   Algebraically show $f(x) = \left| (x+3)^2 - 16 \right|$ is not differentiable at $x = 2$.

(3)   6.   Sketch the graph of the derivative of the function shown.

$$y = 6x^2 - 4x - 7$$
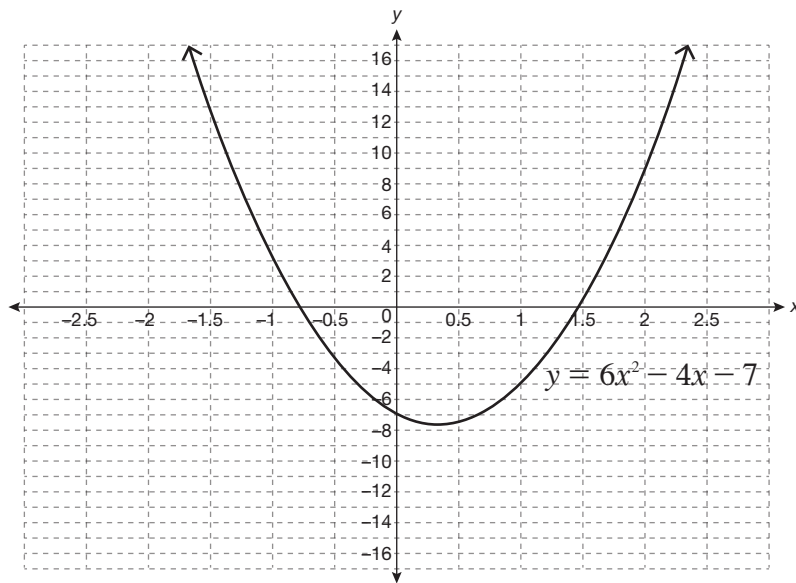
4   7.   For what values of x is the function not differentiable? Justify.

8. Using the power rule, differentiate the following functions. Use positive exponents in each final answer.

①   a. $f(x) = x + 17$

①   b. $y = 10$

②   c. $y = \left(\dfrac{x}{2}\right)^2 + \dfrac{2}{x}$

②   d. $f(x) = \sqrt{5}\,x + \dfrac{5}{\sqrt{x}}$

(2)   e. $g(x) = \dfrac{5x^3 + 3x^2 - 8x + 4}{x}$

9. Find the derivative of each of the following functions using the product rule. Use positive exponents in each final answer.

(2)   a. $h(x) = (3x - 2)(5x - 1)$

(3)   b. $y = \sqrt{x}\left(x^2 + \dfrac{1}{x}\right)$

10. Find the derivative of each of the following functions using the quotient rule. Use positive exponents in each final answer.

(2)   a. $y = \dfrac{3x + 5}{2x}$

(3)   b. $f(x) = \dfrac{x^3}{x + \sqrt{x}}$

11. Evaluate the following expressions.

(2)   a. $h'(1)$, given $h(x) = f(x)g(x)$, $f(1) = 5$, $g(1) = -2$, $f'(1) = 2$, and $g'(1) = 3$.

(2)   b. $h'(2)$, given $h(x) = \dfrac{f(x)}{g(x)}$, $f(2) = 1$, $g(2) = 2$, $f'(2) = -1$, and $g'(2) = 4$.

12. Find the derivative of each of the following functions using the chain rule. Use positive exponents in each final answer.

(2)   a. $y = (x^3 + 3x)^5$

(3)   b. $f(x) = \sqrt{x - \dfrac{1}{x}}$

13. Differentiate the following functions. Express each solution in factored form.

(3)   a. $f(x) = (2x + 5)^3 (6x - 1)^5$

(3)   b. $y = (x-2)^3 \sqrt{2x-1}$