Unit 5 Exam Part 2: Integral Calculus - without calculator

55 minutes. You may *NOT* use a calculator on these problems [50 marks]

1. Let $f'(x) = 6x^2 - 5$. Given that $f(2) = -3$, find $f(x)$. [6]

2. Given $f(2) = 2$, $g(2) = -2$, $f'(2) = -1$, and $g'(2) = 3$

   (a) Find the derivative of $f + g$ for $x = 2$. [2]

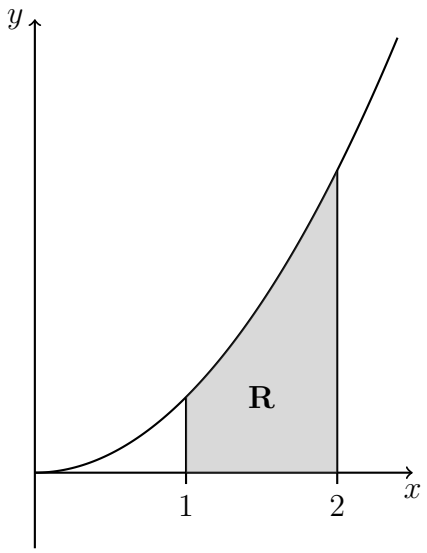
   (b) Find the derivative of $f \times g$ for $x = 2$. [2]

   (c) Find the derivative of $f \div g$ for $x = 2$. [2]

3. Let $f(x) = x^2$.

   (a) Find $\int_1^2 (f(x))^2 \, \mathrm{d}x$ [4]

   (b) The following diagram shows part of the graph of f.



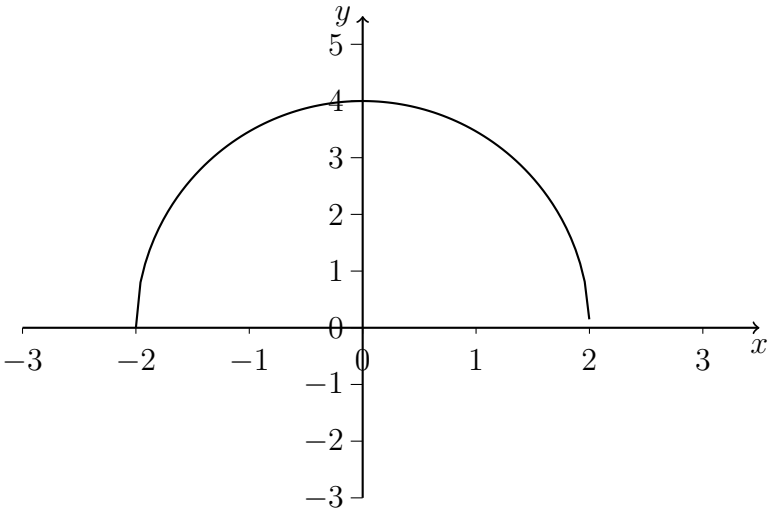
   The shaded region R is enclosed by the graph of f, the x-axis, and the lines $x = 1$ and $x = 2$.
   Find the volume of the solid formed when R is revolved 360° about the x-axis. [2]

4. (a) Find $\int \frac{1}{2x+3} \, \mathrm{d}x$. [2]

   (b) Given $\int_0^3 \frac{1}{2x+3} \, \mathrm{d}x = \ln \sqrt{P}$, find P. [4]

5. The graph of $f(x) = \sqrt{16 - 4x^2}$, for $-2 \leq x \leq 2$, is shown below.

   (a) The following diagram shows part of the graph of f.



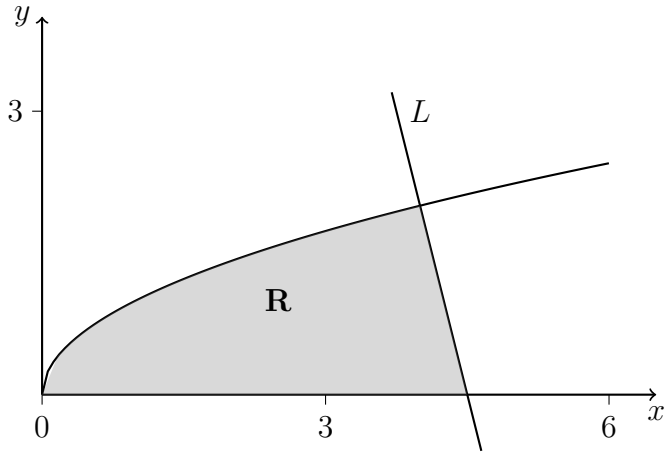
   The region enclosed by the curve of f and the x-axis is rotated 360° about the x-axis.
   Find the volume of the solid formed. [6]

6. Let $f(x) = \sqrt{x}$. Line L is the normal to the graph of f at the point $(4, 2)$.

   (a) Show that the equation of L is $y = -4x + 18$. [4]

   (b) Point A is the x-intercept of L. Find the x-coordinate of A. [2]

   (c) In the diagram below, the shaded region R is bounded by the x-axis, the graph of f, and the line L.



   Find and expression for the area of R. [3]

   (d) The region R is rotated 360° about the x-axis. Find the volume of the solid formed, giving your answer in terms of π. [8]