# MATA32 – Winter 2010
## Some more practice problems

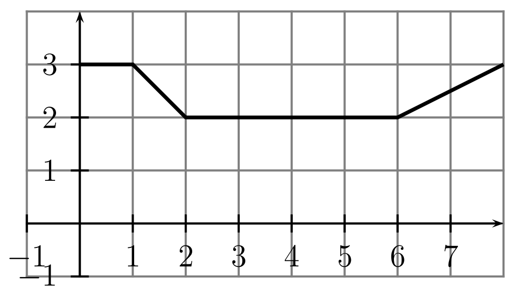
1. Suppose $f'(x) < 0$ for all $x$ in the interval $[3, 5]$. At which value of $x$ in $[3, 5]$ does $f(x)$ have an absolute maximum?

2. Suppose $f'(1) = -8$, $f'(2) = 5$, $f(1) = 10$ and $f(2) = 3$.

   (a) Determine $\int_1^2 f'(t)\,dt$.

   (b) Determine $\int_1^2 f''(x)\,dx$.

3. Let $g(x)$ be defined by the picture below:




   (a) Determine $\int_0^8 g(x)\,dx$.

   (b) Determine $\int_3^7 g(x)\,dx$.

*Solve the above questions first, then continue onto the next page to check your answers...*

SOLUTIONS:

1. $x = 3$
*Solution:* $f'(x) < 0$ means that $f(x)$ is decreasing for $x$ in the interval $[3, 5]$. In particular, $f(x)$ must be largest at the left endpoint, $x = 3$.

2. (a) $-7$
*Solution:* By the fundamental theorem of calculus,

$$\int_1^2 f'(t)\,dt = f(2) - f(1) = 3 - 10 = -7$$

(b) 13
*Solution:* Again by the fundamental theorem of calculus,

$$\int_1^2 f''(t)\,dt = f'(2) - f'(1) = 5 - (-8) = 13.$$

3. (a) 18.5
*Solution:* We have to find the area of the region bounded by the $x$-axis, the $y$-axis, the vertical line $x = 8$, and the function $g(x)$. First, note that the rectangle bounded by the $x$-axis, $y$-axis, the horizontal line $y = 2$, and the vertical line $x = 8$ comprises a big part of this region, and its area is easy to calculate: it's just 16. What's left over to count? There's the one square above the rectangle between $x = 0$ and $x = 1$; the half-square between $x = 1$ and $x = 2$; and the right triangle between $x = 6$ and $x = 8$ (whose area is $\frac{1}{2} \times 2 \times 1 = 1$). So, the total area is

$$\int_0^8 g(x)\,dx = 16 + 1 + 0.5 + 1 = 18.5$$

(b) 8.25
*Solution:* Similarly to above, most of the area is just a rectangle, though this time it's the one bounded by the lines $x = 3$, $y = 2$, $x = 7$, and the $x$-axis. This has area 8. What's left over? That small right triangle above the rectangle, between $x = 6$ and $x = 7$, whose area is $\frac{1}{2} \times 1 \times \frac{1}{2} = \frac{1}{4}$. So, the total area is

$$\int_3^7 g(x)\,dx = 8 + \frac{1}{4} = 8.25$$