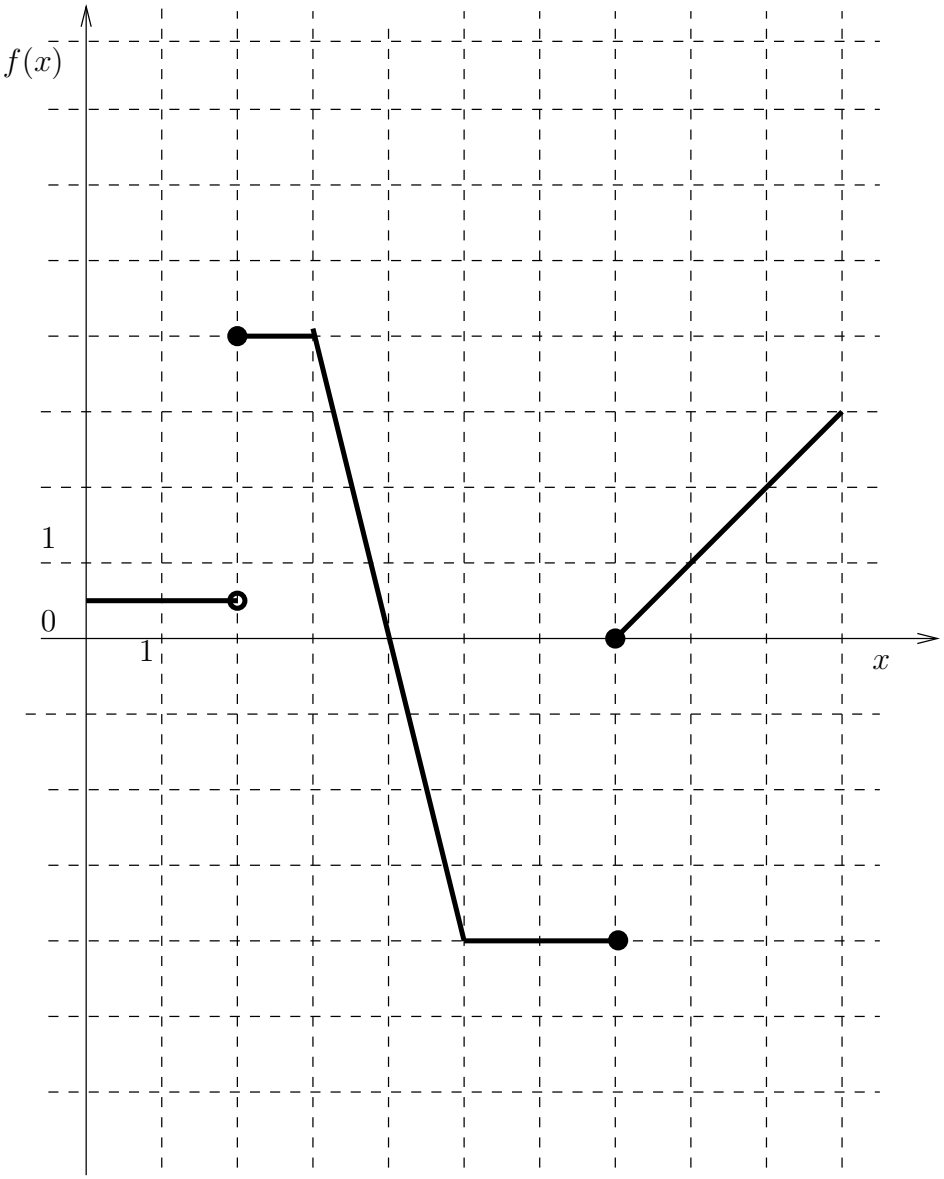
STUDENT NAME: THIS SHEET SHOWS **QUESTION**

Calculus 1550, section 6. Tuesday, April 20, 2004. Eighteenth quiz.

Below the graph of a function $f(x)$ is sketched.

1. [6 points] On the same grid, Sketch a graph of the function

$$g(x) = \int_0^x f(t)dt$$



2. [1.5 point] What is the maximum value of $g(x)$ on $[0, 10]$, and where is it achieved?

3. [1.5 point] What is the minimum value of $g(x)$ on $[0, 10]$, and where is it achieved?

4. [1 point] Suppose

$$\int_a^x f(t)dt = g(x) - 5$$

What is a possible value of a?

STUDENT NAME: THIS SHEET SHOWS **SOLUTION**

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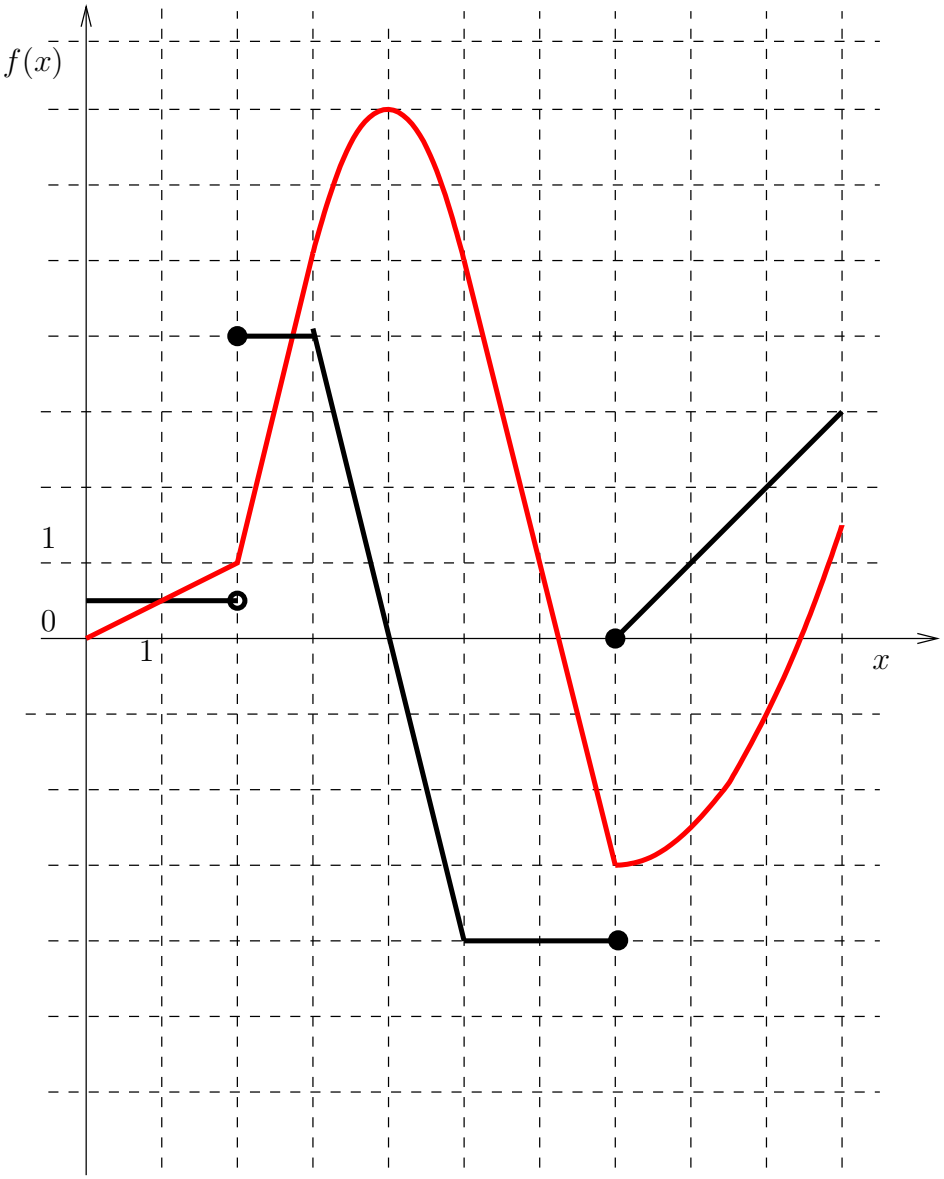

1(Answer). On the left, $f(x)$ is in black, and $g(x)$ in red.

2. [1.5 point] What is the maximum value of $g(x)$ on $[0, 10]$, and where is it achieved?

2(Answer). the maximum, from the sketch, is at $x = 4$. (Note that at this value of x, we have $f(4) = 0$.) Since $g(4) = 4$, the maximum value is 7 .

3. [1.5 point] What is the minimum value of $g(x)$ on $[0, 10]$, and where is it achieved?

3(Answer). the minimum, from the sketch, is at $x = 7$. Since $g(7) = -3$, the minimum value is -3 .

4. [1 point] Suppose

$$\int_a^x f(t)dt = g(x) - 5$$

What is a possible value of a?

4(Answer). This means that $\int_a^x f(t)dt = \int_0^x f(t)dt - 5$ so $5 = \int_0^x f(t)dt - \int_a^x f(t)dt = \int_0^a f(t)dt = g(a)$ (Because the area from 0 to x minus the area from a to x is the area from 0 to a) So, where does $g(a) = 5$? from the sketch, this is at $a = 3$. ($a = 5$ is another possible solution).

STUDENT NAME: THIS SHEET SHOWS **FURTHER COMMENTS**

Calculus 1550, section 6. Tuesday, April 20, 2004. Eighteenth quiz.

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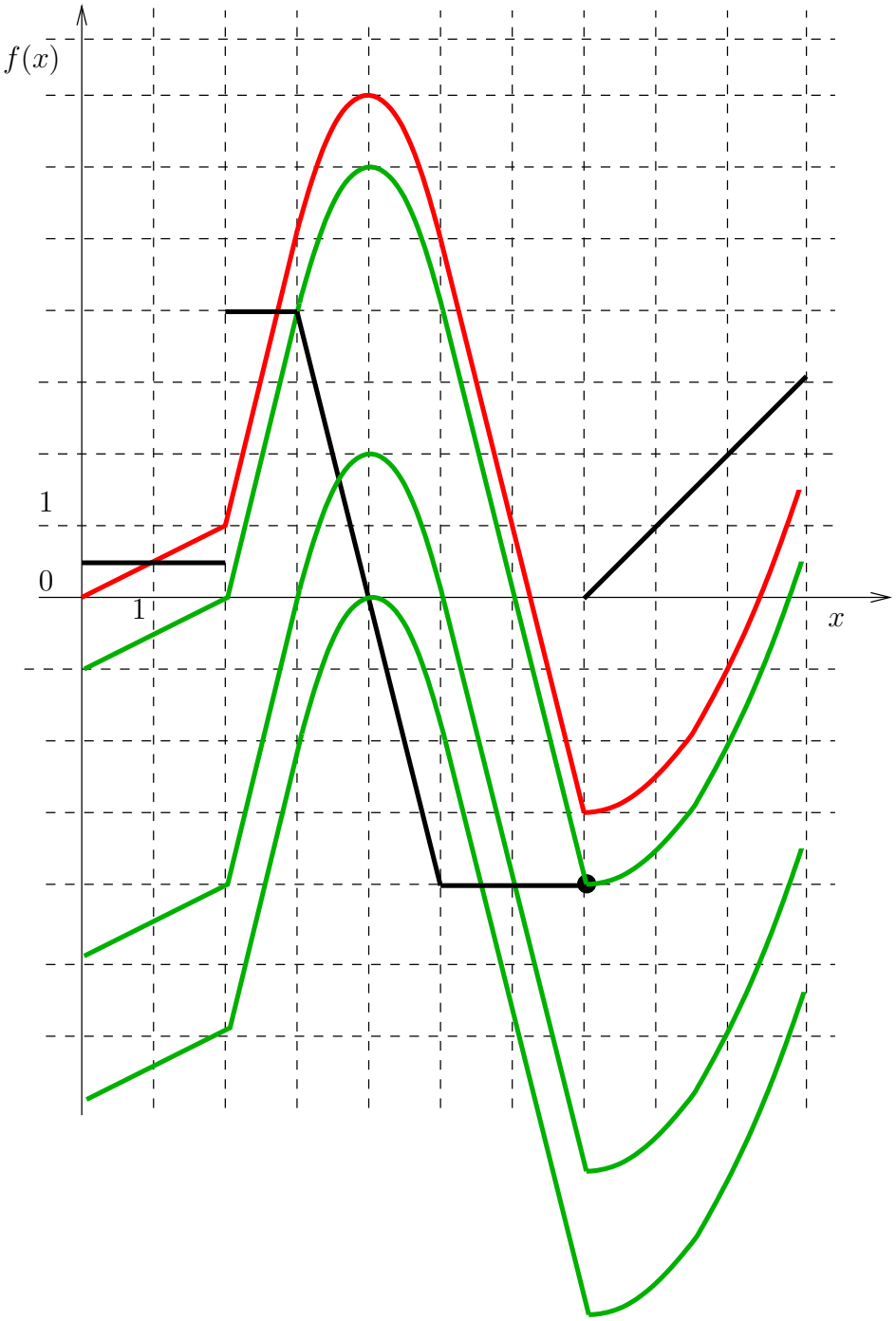

Above, graph shows three more integral functions, obtained by using different starting points:

$$g_2(x) = \int_2^x f(t)dt = g(x) - 1$$

$$g_3(x) = \int_3^x f(t)dt = g(x) - 5$$

$$g_4(x) = \int_4^x f(t)dt = g(x) - 7$$