HOMEWORK #9 – MATH 3210,
FALL 2019

DUE TUESDAY, NOVEMBER 5TH

5.2 #1. Show that if a function f on a bounded interval can be written in the form $g - h$ for functions g and h which are non-decreasing on $[a, b]$, then f is integrable on $[a, b]$.

5.2 #9. Prove that if f is integrable on $[a, b]$ then so is f^2.
Hint: See the text for a substantial hint.

5.2 #10. Prove that if f and g are integrable on $[a, b]$ then so is $f \cdot g$.
Hint: See the text for a substantial hint.

5.3 #4. Compute

$$\frac{d}{dx}\int_{1/x}^{x} e^{-t^2}\,dt.$$

5.3 #5. If $f(x) = -1/x$, then $f'(x) = 1/x^2$. Thus, Theorem 5.3.1 seems to imply that

$$\int_{-1}^{1} (1/x^2)dx = f(1) - f(-1) = -1 - 1 = -2.$$

However, $1/x^2$ is a positive function so its integral over $[-1, 1]$ should be positive. What is wrong?

5.3 #6. If f is a differentiable function on $[a, b]$ and f' is integrable on $[a, b]$, then find $\int_a^b f(x)f'(x)dx$.