King Fahd University of Petroleum & Minerals

Department of Mathematics and Statistics

Semester 161

Math 513 HW Assignment # 2

Due Date: November 1, 2016

1. Prove that $\mathcal{F}(e^{-at^2}) = \sqrt{\frac{\pi}{a}}\, e^{-\frac{w^2}{4a}}$, $a > 0$.
2. Evaluate $\int_a^b t\ \delta(\alpha - t)\ dt$.
3. Prove that $\mathcal{F}\left[\sin(\omega_o\, t)\, H(t)\right] = \frac{\omega_o}{\omega_o^{\,2} - \omega^2} + \frac{\pi i}{2}\left[\ \delta(\omega + \omega_o) - \delta(\omega - \omega_o)\right]$.
4. Use Parseval's equality to evaluate $\int_0^\infty \frac{x^2}{\left(x^2 + a^2\right)^2}\, dx$. [Hint: First evaluate $\mathcal{F}\left[e^{-at}\, H(t)\right]$ and $\mathcal{F}\left[e^{+at}\, H(-t)\right]$]
5. Do textbook problem #9 of section 5.3 on page 266.
6. Do textbook problem #4 of section 5.4 on page 280.
7. Find $\mathcal{F}^{-1}\left[\frac{\cos\omega}{\omega^2 - 2\omega + 2}\right]$.
8. Do textbook problem #5 of section 5.5 on page 285.
9. Do textbook problem #1 of section 5.6 on page 288.