Solution of EECS 315 Test 3 F13

1. Let $\mathrm{G}(f)=\dfrac{j4f}{2+j7f/11}$.

   (a) What numerical value does the magnitude of this function approach as *f* approaches positive infinity?

$$\lim_{f\to\infty}\left|\frac{j4f}{2+j7f/11}\right|=\frac{|j4f|}{|j7f/11|}=\frac{4}{7/11}=\frac{44}{7}\cong 6.285$$

   (b) What numerical value (in radians) does the phase of this function approach as *f* approaches zero from the positive side?

$$\lim_{f\to 0^+}\left[\measuredangle j4f-\measuredangle(2+j7f/11)\right]=\lim_{f\to 0^+}\left[\measuredangle j4f-\measuredangle 2\right]=\pi/2-0=\pi/2$$

2. Find the numerical value of the integral $\int_1^{17}\delta_3(t)\cos(2\pi t/3)dt$. (Be sure you notice that the impulse is periodic.)

   The impulses in the periodic impulse occur at ...-9,-6,-3,0,3,6,9,12,15,18,... At each of these points the cosine value is the same, one, because its period is 3 seconds also. So the integral value is simple the sum of the strengths of the impulse that occur in the time range, 1 to 17 seconds

$$\int_1^{17}\delta_3(t)\cos(2\pi t/3)dt=5$$

3. The generalized derivative of $18\,\mathrm{rect}\left(\dfrac{t-2}{3}\right)$ consists of two impulses. Find their numerical locations and strengths.

   Impulse #1: Location is $t = 0.5$ and strength is 18.

   Impulse #2: Location is $t = 3.5$ and strength is -18.

4. (a) Find the signal energy of $\mathrm{x}(t)=(1/a)\mathrm{rect}(t/a)$ as a function of *a*.

   (b) What value does this signal energy approach as *a* approaches zero?

   (a) Signal Energy is the area under the square of the signal which is $(1/a)^2\times|a|=1/|a|$

   (b) $\lim_{a\to 0}E_x\to\infty$

Solution of EECS 315 Test 3 F13

1. Let $G(f)=\dfrac{j3f}{2+j9f/11}$.

   (a) What numerical value does the magnitude of this function approach as *f* approaches positive infinity?

$$\lim_{f\to\infty}\left|\frac{j3f}{2+j9f/11}\right|=\frac{|j3f|}{|j9f/11|}=\frac{3}{9/11}=\frac{33}{9}\cong 3.667$$

   (b) What numerical value (in radians) does the phase of this function approach as *f* approaches zero from the positive side?

$$\lim_{f\to 0^+}\left[\measuredangle j3f-\measuredangle(2+j9f/11)\right]=\lim_{f\to 0^+}\left[\measuredangle j3f-\measuredangle 2\right]=\pi/2-0=\pi/2$$

2. Find the numerical value of the integral $\int_{-1}^{17}\delta_3(t)\cos(2\pi t/3)dt$. (Be sure you notice that the impulse is periodic.)

The impulses in the periodic impulse occur at ...-9,-6,-3,0,3,6,9,12,15,18,... At each of these points the cosine value is the same, one, because its period is 3 seconds also. So the integral value is simple the sum of the strengths of the impulse that occur in the time range, 1 to 17 seconds.

$$\int_{-1}^{17}\delta_3(t)\cos(2\pi t/3)dt=6$$

3. The generalized derivative of $22\,\mathrm{rect}\left(\dfrac{t-2}{5}\right)$ consists of two impulses. Find their numerical locations and strengths.

   Impulse #1: Location is *t* = -0.5 and strength is 22.

   Impulse #2: Location is *t* = 4.5 and strength is -22.

4. (a) Find the signal energy of $x(t)=(1/a)\mathrm{rect}(t/a)$ as a function of *a*.

   (b) What value does this signal energy approach as *a* approaches zero?

   (a) Signal Energy is the area under the square of the signal which is $(1/a)^2\times|a|=1/|a|$

   (b) $\lim_{a\to 0}E_x\to\infty$

Solution of EECS 315 Test 3 F13

1. Let $G(f)=\dfrac{j11f}{2+j7f/8}$.

   (a) What numerical value does the magnitude of this function approach as *f* approaches positive infinity?

$$\lim_{f\to\infty}\left|\frac{j11f}{2+j7f/11}8\right|=\frac{|j11f|}{|j7f/8|}=\frac{11}{7/8}=\frac{88}{7}\cong 12.571$$

   (b) What numerical value (in radians) does the phase of this function approach as *f* approaches zero from the positive side?

$$\lim_{f\to 0^+}\left[\measuredangle j11f-\measuredangle(2+j7f/8)\right]=\lim_{f\to 0^+}\left[\measuredangle j11f-\measuredangle 2\right]=\pi/2-0=\pi/2$$

2. Find the numerical value of the integral $\int_{-5}^{16}\delta_3(t)\cos(2\pi t/3)dt$. (Be sure you notice that the impulse is periodic.)

The impulses in the periodic impulse occur at ...-9,-6,-3,0,3,6,9,12,15,18,... At each of these points the cosine value is the same, one, because its period is 3 seconds also. So the integral value is simple the sum of the strengths of the impulse that occur in the time range, 1 to 17 seconds.

$$\int_{-5}^{16}\delta_3(t)\cos(2\pi t/3)dt=7$$

3. The generalized derivative of $5\,\mathrm{rect}\left(\dfrac{t-2}{7}\right)$ consists of two impulses. Find their numerical locations and strengths.

   Impulse #1: Location is *t* = -1.5 and strength is 5.

   Impulse #2: Location is *t* = 5.5 and strength is -5.

4. (a) Find the signal energy of $x(t)=(1/a)\mathrm{rect}(t/a)$ as a function of *a*.

   (b) What value does this signal energy approach as *a* approaches zero?

   (a) Signal Energy is the area under the square of the signal which is $(1/a)^2\times|a|=1/|a|$

   (b) $\lim_{a\to 0}E_x\to\infty$