SIMPSON'S RULE HOMEWORK

For exercises 1-5, use the given value of n to approximate the integral using Simpson's Rule. Round off all computations to 4 decimal places.

1. $\int_0^2 e^{-x^2}\,dx$, n = 4

2. $\int_1^4 \sqrt{1+x^3}\,dx$, n = 6

3. $\int_{\pi/2}^{3\pi/2} \frac{\sin x}{x}\,dx$, n = 6

4. $\int_0^{\pi/2} \sqrt{\sin x}\,dx$, n = 6

5. $\int_0^{\pi/2} \frac{dx}{1+\sin x}\,dx$, n = 4

6. A certain curve is given by the following pairs of coordinates:

x	1	2	3	4	5	6	7	8	9
y	0	0.6	0.9	1.2	1.4	1.5	1.7	1.8	2

Use Simpson's rule to approximate the area between the curve, the x-axis, x = 1 and x = 9.

7. A certain curve is given by the following pairs of coordinates:

x	1	2	3	4
y	0	0.6	0.9	1.2

Use Simpson's rule to approximate the area between the curve, the x-axis, x = 1 and x = 4.

THE ANSWERS ARE ON PAGE 2.

ANSWERS:

1. $$\int_0^2 e^{-x^2}dx \approx \frac{2-0}{(3)(4)}\left[e^0+4e^{-0.25}+2e^{-1}+4e^{-2.25}+e^{-4}\right]$$
$$\approx \frac{1}{6}[1+3.1152+0.7358+0.4216+0.0183]=\frac{1}{6}[5.2906]\approx 0.8818$$

2. $$\int_1^4 \sqrt{1+x^3}\,dx \approx \frac{4-1}{(3)(6)}\left[\sqrt{2}+4\sqrt{4.375}+2\sqrt{9}+4\sqrt{16.625}+2\sqrt{28}+4\sqrt{43.875}+\sqrt{65}\right]$$
$$\approx \frac{1}{6}[1.4142+8.3666+6+16.3095+10.5830+26.4953+8.0623]=\frac{1}{6}[77.2309]\approx 12.8718$$

3. $$\int_{\pi/2}^{3\pi/2}\frac{\sin x}{x}dx \approx \frac{\frac{3\pi}{2}-\frac{\pi}{2}}{(3)(6)}\left[\frac{\sin\frac{\pi}{2}}{\frac{\pi}{2}}+4\frac{\sin\frac{2\pi}{3}}{\frac{2\pi}{3}}+2\frac{\sin\frac{5\pi}{6}}{\frac{5\pi}{6}}+4\frac{\sin\pi}{\pi}+2\frac{\sin\frac{7\pi}{6}}{\frac{7\pi}{6}}+4\frac{\sin\frac{4\pi}{3}}{\frac{4\pi}{3}}+\frac{\sin\frac{3\pi}{2}}{\frac{3\pi}{2}}\right]$$
$$\approx \frac{\pi}{18}[0.6366+1.6540+0.3820+0+(-0.2728)+(-0.8270)+(-0.2122)]=\frac{\pi}{18}[1.3606]\approx 0.2375$$

4. $$\int_0^{\pi/2}\sqrt{\sin x}\,dx \approx \frac{\frac{\pi}{2}-0}{(3)(6)}\left[\sqrt{\sin 0}+4\sqrt{\sin\frac{\pi}{12}}+2\sqrt{\sin\frac{\pi}{6}}+4\sqrt{\sin\frac{\pi}{4}}+2\sqrt{\sin\frac{\pi}{3}}+4\sqrt{\sin\frac{5\pi}{12}}+\sqrt{\sin\frac{\pi}{2}}\right]$$
$$\approx \frac{\pi}{36}[0+2.0350+1.4142+3.3636+1.8612+3.9313+1]=\frac{\pi}{36}[13.6053]\approx 1.1873$$

5. $$\int_0^{\pi/2}\frac{dx}{1+\sin x}dx \approx \frac{\frac{\pi}{2}-0}{(3)(4)}\left[\frac{1}{1+\sin 0}+4\frac{1}{1+\sin\frac{\pi}{8}}+2\frac{1}{1+\sin\frac{\pi}{4}}+4\frac{1}{1+\sin\frac{3\pi}{8}}+\frac{1}{1+\sin\frac{\pi}{2}}\right]$$
$$\approx \frac{\pi}{24}[1+2.8929+1.1716+2.0791+0.5]=\frac{\pi}{24}[7.6436]\approx 1.0005$$

6. $$\frac{9-1}{(3)(8)}[0+4(.6)+2(.9)+4(1.2)+2(1.4)+4(1.5)+2(1.7)+4(1.8)+2]$$
$$=\frac{1}{3}[0+2.4+1.8+4.8+2.8+6+3.4+7.2+2]=\frac{1}{3}[30.4]\approx 10.1333$$

7. It is impossible to do this problem using Simpson’s rule since there are n = 3 subintervals and Simpson’s rule only works when n is even.