

Lab 4

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Section 32

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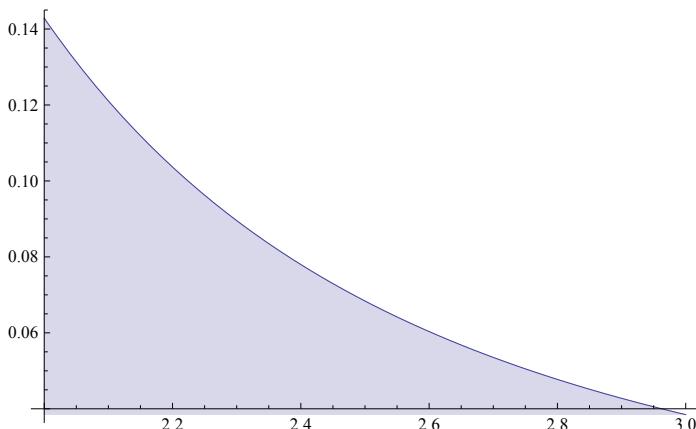
```
Quit[]  
  
f[x_] = 1 / (-1 + x^3)  
  
1  
- 1 + x^3
```

Question 1: Determine the antiderivative for $f(x)$.

$$g[x_] = \int \frac{1}{-1 + x^3} dx$$
$$-\frac{\text{ArcTan}\left[\frac{1+2 x}{\sqrt{3}}\right]}{\sqrt{3}} + \frac{1}{3} \log[1-x] - \frac{1}{6} \log[1+x+x^2]$$

Question 2: Generate a plot of the closed integral of $f(x)$ from 2 to 3.

```
Plot[-ArcTan[(1+2 x)/Sqrt[3]]/Sqrt[3] + 1/3 Log[1-x] - 1/6 Log[1+x+x^2], {x, -12.4641, 12.4641}]  
  
Plot[f[x], {x, 2, 3}, Filling -> Bottom]
```



Question 3: Estimate the integral using the trapaziod rule and $n=5$

```
N[1 / 5]
0.2

h[x_] = 1 / (-1 + (x + 1)^3)
```

$$\frac{1}{-1 + (1 + x)^3}$$

```
(1 / 10) * Sum[f[x] + h[x], {x, 2, 3, 0.2}]
0.0623387
```

Question 4a: Estimate the integral with the Simpsons rule with n=10

```
(1 / 30) *
(f[2] + f[3] + (4 * Sum[f[x], {x, 2.1, 2.9, 0.2}]) + (2 * Sum[f[x], {x, 2.2, 2.8, 0.2}]))
0.0753903
```

Question 4b: Estimate the integral with the Simpsons rule with n=20

```
N[1 / 20]
0.05

(1 / 60) *
(f[2] + f[3] + (4 * Sum[f[x], {x, 2.05, 2.95, 0.1}]) + (2 * Sum[f[x], {x, 2.1, 2.9, 0.1}]))
0.0753894
```

Question 4c: Estimate the integral with Simpsons rule with n=40

```
N[1 / 40]
0.025

(1 / 120) * (f[2] + f[3] + (4 * Sum[f[x], {x, 2.025, 2.975, 0.05}]) +
(2 * Sum[f[x], {x, 2.05, 2.95, 0.05}]))
0.0753893549671799`16
0.07538935496717990
```

Below Work Done to Check for Correctness:

```
Integrate[f[x], {x, 2, 3}]
1/6 \left(2 \sqrt{3} \text{ArcTan}\left[\frac{5}{\sqrt{3}}\right]-2 \sqrt{3} \text{ArcTan}\left[\frac{7}{\sqrt{3}}\right]+\text{Log}\left[\frac{28}{13}\right]\right)

N\left[\frac{1}{6} \left(2 \sqrt{3} \text{ArcTan}\left[\frac{5}{\sqrt{3}}\right]-2 \sqrt{3} \text{ArcTan}\left[\frac{7}{\sqrt{3}}\right]+\text{Log}\left[\frac{28}{13}\right]\right)\right]
0.07538935102320451`16
0.07538935102320451
```