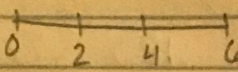
Practice Problems
5.1-5.3, 5.5, 6.1-6.3

1) $\Delta t = \frac{b-a}{n} = \frac{6-0}{3} = 2$



$f(t) = t^2 + 2t$

LHS: $2(f(0)+f(2)+f(4))$
$= 2(0+8+24)$
$= 64$

RHS: $2(f(2)+f(4)+f(6))$
$= 2(8+24+48)$
$= 160$

Since $f(t)$ is increasing on $[0,6]$ the RHS is an overestimate and the LHS is an underestimate.
The units are meters and the integral represents the distance traveled.

2) This should be in your own words but something along the lines of "total change / area under the curve, we estimate it using left & right hand sums."

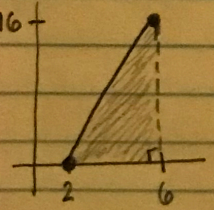
3) Since $g(t)$ is decreasing on $[0,8]$, we use a LHS to overestimate.

$\Delta t = \frac{8-0}{4} = 2$ LHS: $2(g(0)+g(2)+g(4)+g(6))$
$= 2(1-3-15-35)$
$= -104$

4) $A = \int_0^5 f(x)\,dx$

5) $A = \int_0^3 f(x)\,dx + \left|\int_3^8 f(x)\,dx\right|$

6) $A = \int_0^{3.12} (4x-x^2) - (\frac{1}{2}x^{3/2})\,dx$

7) 

$A = \frac{1}{2}(4)(16) = 32 = \int_2^6 (4x-8)\,dx$

8) (a) Positive (b) Negative (c) Zero

9) $\int (5x+7)\,dx = \frac{5}{2}x^2 + 7x + C$

10) $\int (t^2+5t+1)\,dt = \frac{1}{3}t^3 + \frac{5}{2}t^2 + t + C$

11) $\int (\frac{3}{x} - \frac{2}{x^2})\,dx = 3\ln|x| + \frac{2}{x} + C$

12) $\int 3\sqrt{w}\,dw = 2w^{3/2} + C$

13) $\int (e^x + \frac{1}{\sqrt{x}})\,dx = e^x + 2\sqrt{x} + C$

14) $\int 100e^{4t}\,dt = 25e^{4t} + C$

15) $\int 2\pi r\,dr = \pi r^2 + C$

16) $\int (6x - 7^x)\,dx = 3x^2 - \frac{7^x}{\ln(7)} + C$

17) $f'(x) = 2xe^{x^2}$

18) $\int_0^6 2xe^{x^2}dx = e^{x^2}\Big|_0^6 = e^{36} - 1$

19) $g'(t) = 2t\ln t + t$

20) $\int_1^4 (2t\ln t + t)dt = t^2\ln t\Big|_1^4 = 16\ln(4) - 1\ln(1)$
$= 32\ln(2)$

21) $\int_0^b x^2dx = \frac{x^3}{3}\Big|_0^b = \frac{b^3}{3} - \frac{0^3}{3} = 243$
$b^3 = 729$
$b = 9$

22) $\int_0^3 t^3dt = \frac{t^4}{4}\Big|_0^3 = 81/4$

23) $\int_4^9 x^{1/2}dx = \frac{2}{3}x^{3/2}\Big|_4^9 = \frac{2}{3}(9)^{3/2} - \frac{2}{3}(4)^{3/2} = 18 - 16/3 = 38/3$

24) $\int_0^2 (3t^2 + 4t + 3)dt = t^3 + 2t^2 + 3t\Big|_0^2 = 22$

25) $\int_0^1 2e^x dx = 2e^x\Big|_0^1 = 2e - 2$

26) $\int_2^7 (1/t - 2/t^3)dt = \ln|t| + t^{-2}\Big|_2^7 = \ln(7) + \frac{1}{49} - \ln(2) - 1/4$

27) $\int_0^1 (y^2 + y^4)dy = \frac{1}{3}y^3 + 1/5\,y^5\Big|_0^1 = 1/3 + 1/5 = 8/15$