6. $\Delta x = \frac{7-3}{n} = \frac{4}{n}$

$x_i = 3 + \frac{4}{n} i$

$\int_3^7 (9-8x)\,dx$

$= \lim_{n\to\infty} \sum_{i=1}^{n} \left(9 - 8\left(3+\frac{4}{n}i\right)\right)\left(\frac{4}{n}\right)$

$= \lim_{n\to\infty} \sum_{i=1}^{n} \left(9 - 24 - \frac{32}{n}i\right)\left(\frac{4}{n}\right)$

$= \lim_{n\to\infty} \left(\frac{4}{n}\right) \sum_{i=1}^{n} \left(-15 - \frac{32}{n}i\right)$

$= \lim_{n\to\infty} \left(\frac{4}{n}\right) \left[\sum_{i=1}^{n}(-15) - \sum_{i=1}^{n} \frac{32}{n} i\right]$

$= \lim_{n\to\infty} \left(\frac{4}{n}\right) \left[-15n - \frac{32}{n}\sum_{i=1}^{n} i\right]$

$= \lim_{n\to\infty} \left(\frac{4}{n}\right) \left[-15n - \frac{32}{\cancel{n}} \frac{\cancel{n}(n+1)}{2}\right]$

$= \lim_{n\to\infty} \left(\frac{4}{n}\right) \left[-15n - 16(n+1)\right]$

$= \lim_{n\to\infty} \left(\frac{4}{n}\right) \left[-15n - 16n - 16\right]$

$= \lim_{n\to\infty} \left(\frac{4}{n}\right) \left[-31n - 16\right]$

$= \lim_{n\to\infty} \left[\frac{-124\cancel{n}}{\cancel{n}} - \frac{64}{n}\right]$

$= -124 - 0$

$= \boxed{-124}$

7a. $\int_0^{30} f(x)\,dx = \underbrace{\frac{1}{2}(10)(60)}_{\text{Area of Triangle from 0 to 10}} + \underbrace{5(60)}_{\text{Area of Rectangle from 10 to 15}} + \underbrace{\frac{1}{2}(15)(60)}_{\text{Area of Triangle from 15 to 30}}$

$= 300 + 300 + 450$

$= \boxed{1050}$

7b. $\int_{30}^{40} f(x)\,dx = -\frac{1}{2}(10)(40) \leftarrow$ Area of Triangle from 30 to 40

$= \boxed{-200}$

8a. $\int_1^{25} \left(\frac{7}{\sqrt{u}} + \frac{8u}{\sqrt{u}}\right) du = \int_1^{25} \left(7u^{-\frac{1}{2}} + 8u^{1-\frac{1}{2}}\right) du$

$= \int_1^{25} \left(7u^{-\frac{1}{2}} + 8u^{\frac{1}{2}}\right) du$

$= \frac{7u^{-\frac{1}{2}+1}}{-\frac{1}{2}+1} + \frac{8u^{\frac{1}{2}+1}}{\frac{1}{2}+1} \Big|_1^{25}$

$= \frac{7u^{\frac{1}{2}}}{\frac{1}{2}} + \frac{8u^{\frac{3}{2}}}{\frac{3}{2}} \Big|_1^{25}$

$= 14\sqrt{u} + \frac{16}{3}\sqrt{u}^3 \Big|_1^{25}$

$= 14\sqrt{25} + \frac{16}{3}\sqrt{25}^3 - \left(14\sqrt{1} + \frac{16}{3}\sqrt{1}^3\right)$

$= 14(5) + \frac{16}{3} \cdot 5^3 - \left(14 + \frac{16}{3}\right)$

$= 70 + \frac{2000}{3} - 14 - \frac{16}{3}$

$= \frac{56 \cdot 3}{1 \cdot 3} + \frac{1984}{3}$

$= \frac{168}{3} + \frac{1984}{3}$

$= \boxed{\frac{2152}{3}}$

≈ 717.3

8b. $\int_0^{\frac{\pi}{3}} \sec^2 t\,dt = \tan t \Big|_0^{\frac{\pi}{3}}$

$= \tan\frac{\pi}{3} - \tan 0$

$= \sqrt{3} - 0$

$= \boxed{\sqrt{3}}$

9. $\boxed{g'(x) = \frac{11}{x^8 + 15}}$