1. Define the term "antiderivative" in your own words.

7. The antiderivative of an acceleration function is a ________ function.

Velocity

11. $\int (10x^2 - 2)\, dx$

$\frac{10x^3}{3} - 2x + C$

15. $\int \frac{3}{t^2}\, dt$

$\int 3t^{-2}\, dt \quad \frac{3t^{-1}}{-1} + C = -3t^{-1} + C$

$-\frac{3}{t} + C$

25. $\int x^2 x^3\, dx$

$\int x^5\, dx = \frac{x^6}{6} + C$

$v(t) = -32t + 48$

at $t=0$ $\quad s=0$

find: v at $t=0$ $\qquad v=48$

maximum s

s at $t=2$

$-32t+48=0 \qquad -32t=-48$

$-2t=-3$

$t=\frac{3}{2}$

$$\int -32t+48 \, dt$$

$-16t^2+48t+C$

$s(t) = -16t^2+48t$

at $t=0$ $\quad s=0$

$C=0$

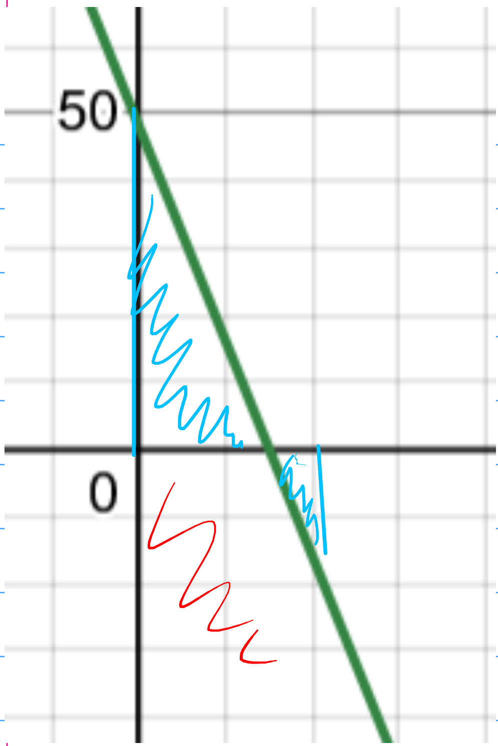
$$\int_0^2 -32t+48 \, dt$$

$$-16t^2+48t+C\Big|_0^2$$

$$(-16(4)+48(2)+\cancel{C}) - (\cancel{C})$$

$-16(4)+48(2)$

$-64+96=32$



$$\int \sin x \, dx$$

$$-\cos x + C$$

$$\int_0^{\pi} \sin x \, dx$$

$$-\cos(\pi) + C - \left(-\cos(0) + C\right)$$

$$1 \cancel{+C} - (-1 \cancel{+C})$$

$$2$$

$$\int_{\frac{\pi}{2}}^{\pi} \sin(x)\,dx = 1$$

$$-\cos(\pi)+C-\left(-\cos\left(\tfrac{\pi}{2}\right)+c\right)$$

$$1+\cancel{C}-0+\cancel{C}$$

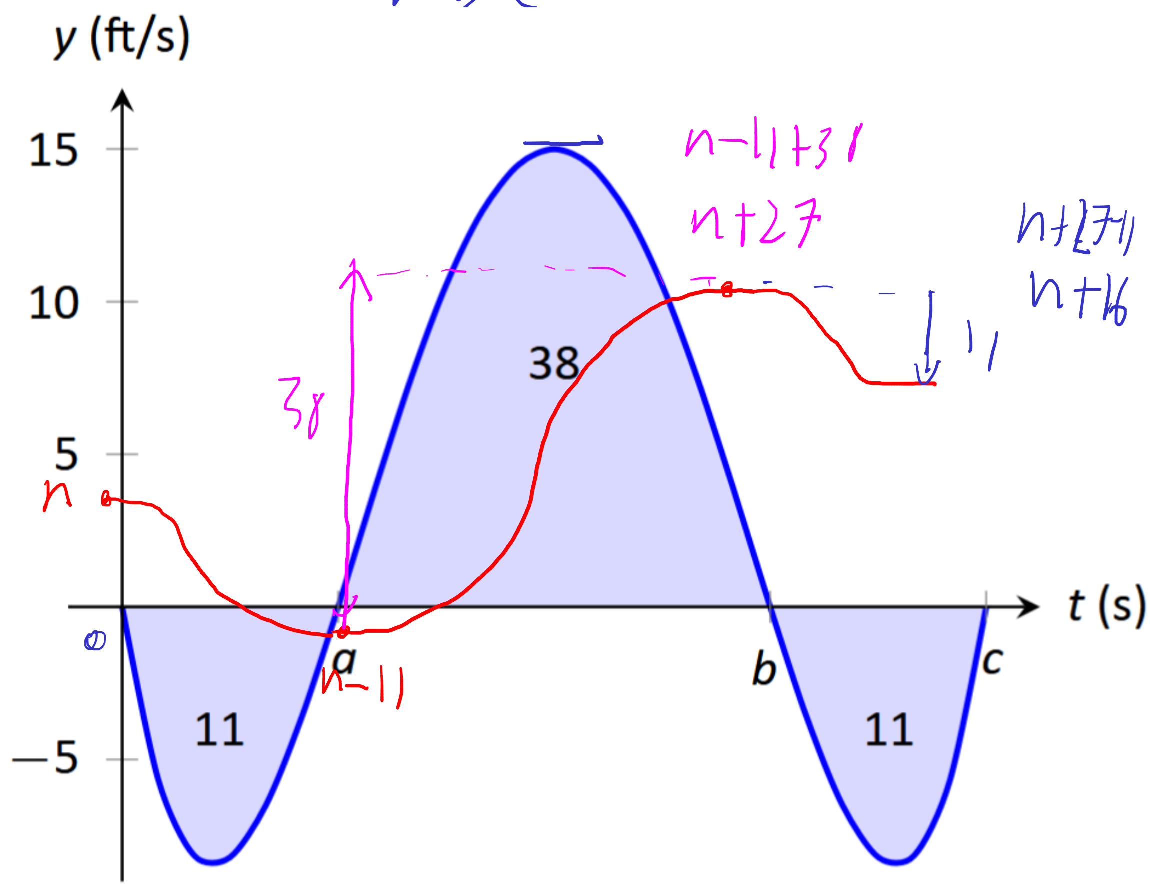
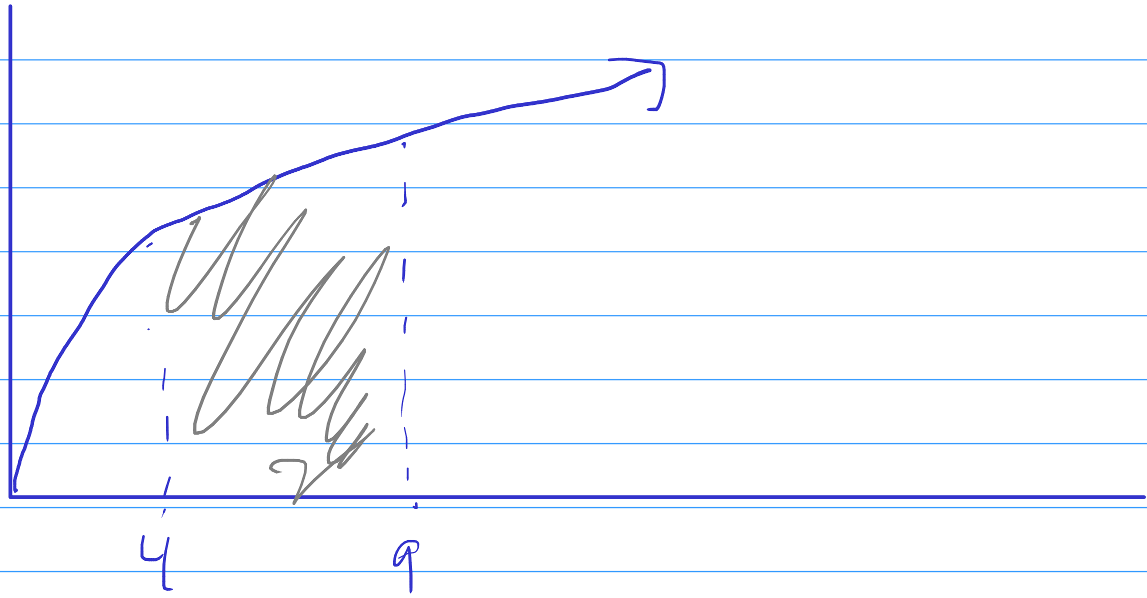


Figure 5.2.8: A graph of a velocity in Example 5.2.5.

4. $\int_4^9 \sqrt{u}\, du$



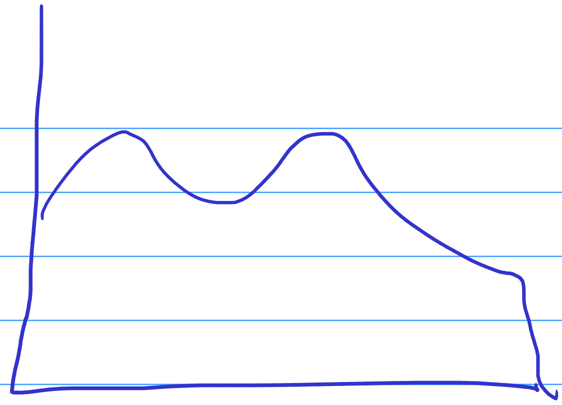
$$\int_4^9 u^{\frac{1}{2}}\, du$$

$$\frac{u^{\frac{1}{2}+1}}{\frac{1}{2}+1} + C = \left.\frac{u^{\frac{3}{2}}}{3/2} + C\,\right|_4^9$$

$$\frac{2}{3}\cdot 9^{\frac{3}{2}} \cancel{+C} - \frac{2}{3}\cdot 4^{\frac{3}{2}} \cancel{+C}$$

$$\frac{2}{3}\cdot 27 - \frac{2}{3}\cdot 8$$

$$18 - 5\tfrac{1}{3} = 12 + \tfrac{2}{3}$$



$y = x^2 + x - 5$ and $y = 3x - 2.$

$(-1)^2 + -1 - 5$

$= 1 - 1 - 5 = -5$

$3(-1) - 2$

$= -5$

$3^2 + 3 - 5$

$9 + 3 - 5$

$12 - 5$

7

$3(3) - 2$

$9 - 2$

7

$$\int_{-1}^{3} 3x - 2 \, dx$$

$$- \int_{-1}^{3} x^2 + x - 5 \, dx$$

$$\frac{3}{2}x^2 - 2x + c \Big|_{-1}^{3}$$

$$\left(\frac{3}{2}(9) - 6 \cancel{+C}\right) - \left(\frac{3}{2} + 2 \cancel{+C}\right)$$

$$13.5 - 6 - (3.5)$$

$$4$$

$$\int_{-1}^{3} x^2 + x - 5 \, dx$$

$$\frac{1}{3}x^3 + \frac{1}{2}x^2 - 5x + C \Big|_{-1}^{3}$$

$$\left(9 + \frac{9}{2} - 15 \cancel{+C}\right) - \left(\frac{-1}{3} + \frac{1}{2} + 5 \cancel{+C}\right)$$

$$13.5 - 15 - \left(5 + \frac{1}{6}\right)$$

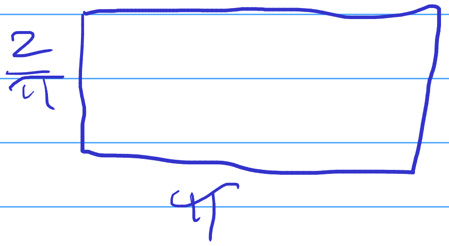
$$-1.5 - \left(5 + \frac{1}{6}\right)$$

$$-6.5 - \frac{1}{6}$$

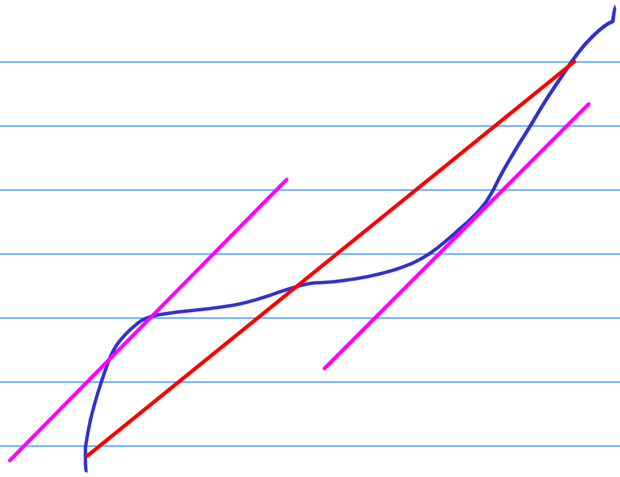
$$-6.\overline{6}$$

$$4 - (-6.\overline{6}) = 10.\overline{6}$$

$$\int_0^{\pi} \sin x \, dx = 2$$



$A = 2$



$$f(x) = (x^2 + 3x - 5)^{10}$$

$$f'(x) = 10(x^2+3x-5)^9(2x+3)$$

$\frac{du}{dx}$

$$\int 10\,\underbrace{(x^2+3x-5)}_{u}{}^9\,\underbrace{(2x+3)\,dx}_{du}$$

$$\int 10u^9\,du$$

$$u^{10}$$

$$(x^2+3x-5)^{10}$$

$$\int \underbrace{x^3}_{u} x^2 \, dx$$

$u = x^3$

$du = 3x^2 dx$

$$\frac{1}{3} \int x^3 \cdot 3x^2 \, dx$$

$$\frac{1}{3} \int u \, du$$

$$\frac{1}{3} \left(\frac{u^2}{2} \right) + C$$

$$\frac{x^6}{6} + C$$

$$\int \cos(\underbrace{5x}_{u})\, dx.$$

$u = 5x$
$du = 5dx$

$$\frac{1}{5}\int \cos(5x)\cdot 5dx$$

$$\frac{1}{5}\int \cos(u)\, du$$

$$\frac{1}{5}\sin(u) \qquad \frac{1}{5}\sin(5x) + C$$

$$\int \frac{7}{-3x+1}\, dx$$

$u = -3x+1$
$du = -3\,dx$

$$\left(-\frac{1}{3}\right)\int \frac{7}{(-3x+1)}\overbrace{(-3)dx}^{du}$$

$$\frac{7}{4x^2+3x}$$

$$-\frac{1}{3}\int \frac{7}{u}\, du$$

$$-\frac{7}{3}\int \frac{1}{u}\, du$$

$$-\frac{7}{3}\ln(u) + C$$

$$-\frac{7}{3}\ln(-3x+1) + C$$