3. $f(x)=1-x^3+5x^5-3x^7 \Rightarrow F(x)=x-\frac{x^{3+1}}{3+1}+5\frac{x^{5+1}}{5+1}-3\frac{x^{7+1}}{7+1}+C=x-\frac{1}{4}x^4+\frac{5}{6}x^6-\frac{3}{8}x^8+C$

5. $f(x)=5x^{1/4}-7x^{3/4} \Rightarrow F(x)=5\frac{x^{1/4+1}}{\frac{1}{4}+1}-7\frac{x^{3/4+1}}{\frac{3}{4}+1}+C=5\frac{x^{5/4}}{5/4}-7\frac{x^{7/4}}{7/4}+C=4x^{5/4}-4x^{7/4}+C$

13. $h(x)=x^3+5\sin x \Rightarrow H(x)=\frac{1}{4}x^4+5(-\cos x)+C=\frac{1}{4}x^4-5\cos x+C$

15. $f(t)=4\sqrt{t}-\sec t\tan t \Rightarrow F(t)=\frac{4}{3/2}t^{3/2}-\sec t+C=\frac{8}{3}t^{3/2}-\sec t+C_n$ on the interval $\left(n\pi-\frac{\pi}{2},n\pi+\frac{\pi}{2}\right)$.

17. $f''(x)=6x+12x^2 \Rightarrow f'(x)=6\cdot\frac{x^2}{2}+12\cdot\frac{x^3}{3}+C=3x^2+4x^3+C \Rightarrow$

$f(x)=3\cdot\frac{x^3}{3}+4\cdot\frac{x^4}{4}+Cx+D=x^3+x^4+Cx+D$ [C and D are just arbitrary constants]

23. $f'(x)=1-6x \Rightarrow f(x)=x-3x^2+C$. $f(0)=C$ and $f(0)=8 \Rightarrow C=8$, so $f(x)=x-3x^2+8$.

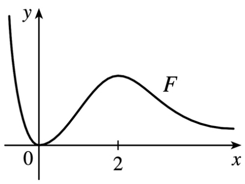
29. $f''(x)=24x^2+2x+10 \Rightarrow f'(x)=8x^3+x^2+10x+C$. $f'(1)=8+1+10+C$ and $f'(1)=-3 \Rightarrow 19+C=-3 \Rightarrow$ $C=-22$, so $f'(x)=8x^3+x^2+10x-22$ and hence, $f(x)=2x^4+\frac{1}{3}x^3+5x^2-22x+D$. $f(1)=2+\frac{1}{3}+5-22+D$ and $f(1)=5 \Rightarrow D=22-\frac{7}{3}=\frac{59}{3}$, so $f(x)=2x^4+\frac{1}{3}x^3+5x^2-22x+\frac{59}{3}$.

31. $f''(\theta)=\sin\theta+\cos\theta \Rightarrow f'(\theta)=-\cos\theta+\sin\theta+C$. $f'(0)=-1+C$ and $f'(0)=4 \Rightarrow C=5$, so $f'(\theta)=-\cos\theta+\sin\theta+5$ and hence, $f(\theta)=-\sin\theta-\cos\theta+5\theta+\text{D}$. $f(0)=-1+D$ and $f(0)=3 \Rightarrow D=4$, so $f(\theta)=-\sin\theta-\cos\theta+5\theta+4$.

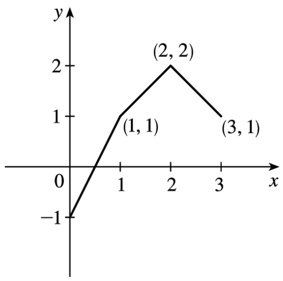
35. $f''(x)=2+\cos x \Rightarrow f'(x)=2x+\sin x+C \Rightarrow f(x)=x^2-\cos x+Cx+D$. $f(0)=-1+D$ and $f(0)=-1 \Rightarrow D=0$. $f\left(\frac{\pi}{2}\right)=\pi^2/4+\left(\frac{\pi}{2}\right)C$ and $f\left(\frac{\pi}{2}\right)=0 \Rightarrow \left(\frac{\pi}{2}\right)C=-\pi^2/4 \Rightarrow C=-\frac{\pi}{2}$, so $f(x)=x^2-\cos x-\left(\frac{\pi}{2}\right)x$.

39. b is the antiderivative of f. For small x, f is negative, so the graph of its antiderivative must be decreasing. But both a and c are increasing for small x, so only b can be f's antiderivative. Also, f is positive where b is increasing, which supports our conclusion.

41. The graph of F will have a minimum at 0 and a maximum at 2, since $f=F'$ goes from negative to positive at $x=0$, and from positive to negative at $x=2$.



43.



$$f'(x)=\begin{cases} 2 & \text{if } 0\le x<1 \\ 1 & \text{if } 1<x<2 \\ -1 & \text{if } 2<x\le 3 \end{cases} \Rightarrow f(x)=\begin{cases} 2x+C & \text{if } 0\le x<1 \\ x+D & \text{if } 1<x<2 \\ -x+E & \text{if } 2<x\le 3 \end{cases} \quad f(0)=-1 \Rightarrow 2(0)+C=-1 \Rightarrow C=-1.$$

Starting at the point $(0,-1)$ and moving to the right on a line with slope 2 gets us to the point $(1,1)$. The slope for $1<x<2$ is 1, so we get to the point $(2,2)$. Here we have used the fact that f is continuous. We can include the point $x=1$ on either the first or the second part of f. The line connecting $(1,1)$ to $(2,2)$ is $y=x$, so $D=0$. The slope for $2<x\le 3$ is -1, so we get to $(3,1)$. $f(3)=1 \Rightarrow -3+E=1 \Rightarrow E=4$. Thus,

$$f(x)=\begin{cases} 2x-1 & \text{if } 0\le x\le 1 \\ x & \text{if } 1<x<2 \\ -x+4 & \text{if } 2\le x\le 3 \end{cases}$$

Note that $f'(x)$ does not exist at $x=1$ or at $x=2$.

55. $a(t)=v'(t)=t-2 \Rightarrow v(t)=\frac{1}{2}t^2-2t+C$. $v(0)=C$ and $v(0)=3 \Rightarrow C=3$, so $v(t)=\frac{1}{2}t^2-2t+3$ and $s(t)=\frac{1}{6}t^3-t^2+3t+D$. $s(0)=D$ and $s(0)=1 \Rightarrow D=1$, and $s(t)=\frac{1}{6}t^3-t^2+3t+1$.

63. Using Exercise with $a=-32$, $v_0=0$, and $s_0=h$ (the height of the cliff), we know that the height at time t is $s(t)=-16t^2+h$. $v(t)=s'(t)=-32t$ and $v(t)=-120 \Rightarrow -32t=-120 \Rightarrow t=3.75$, so $0=s(3.75)=-16(3.75)^2+h \Rightarrow h=16(3.75)^2=225$ ft.

68. $v'(t)=a(t)=-22$. The initial velocity is 50 mi / h = $\frac{50 \cdot 5280}{3600}=\frac{220}{3}$ ft / s, so $v(t)=-22t+\frac{220}{3}$. The car stops when $v(t)=0 \Leftrightarrow t=\frac{220}{3 \cdot 22}=\frac{10}{3}$. Since $s(t)=-11t^2+\frac{220}{3}t$, the distance covered is $s\left(\frac{10}{3}\right)=-11\left(\frac{10}{3}\right)^2+\frac{220}{3}\cdot\frac{10}{3}=\frac{1100}{9}=122.\overline{2}$ ft.

69. $a(t)=k$, the initial velocity is 30 mi / h $=30 \cdot \frac{5280}{3600}=44$ ft / s, and the final velocity (after 5 seconds) is 50 mi / h $=50 \cdot \frac{5280}{3600}=\frac{220}{3}$ ft / s . So $v(t)=kt+C$ and $v(0)=44 \Rightarrow C=44$. Thus, $v(t)=kt+44$ $\Rightarrow v(5)=5k+44$. But $v(5)=\frac{220}{3}$, so $5k+44=\frac{220}{3} \Rightarrow 5k=\frac{88}{3} \Rightarrow k=\frac{88}{15} \approx 5.87$ ft / s ^{2}.