Topic 19: Definite Integrals

Compute each integral exactly.

1. $\int_0^1 \left(x\sqrt{x} + x^{-1/2} \right) dx$

2. $\int_0^{\pi/4} \sec x \tan x \, dx$

3. $\int_0^3 \left(3e^{2x} - x^2 \right) dx$

4. $\int_0^3 \left(x^3 - \sin x \right) dx$

Find the position function $s(t)$ from the given velocity or acceleration function and initial value(s). Assume that units are feet and seconds.

5. $v(t) = 40 - \sin t,\ s(0) = 2$

6. $v(t) = 25\left(1 - e^{-2t}\right),\ s(0) = 0$

7. $a(t) = 4 - t,\ v(0) = 8,\ s(0) = 0$

Find the function $f(x)$ satisfying the given conditions.

8. $f'(x) = 4x^2 - 1,\ f(0) = 2$

9. $f'(x) = 3e^x + x,\ f(0) = 4$

Answers

1) $\frac{12}{5}$

2) $\sqrt{2}-1$

3) $\frac{3}{2}e^{6}-\frac{21}{2}$

4) $\frac{77}{4}+\cos 3$

5) $s(t)=40t+\cos t+1$

6) $s(t)=25\left(t+\frac{1}{2}e^{-2t}-\frac{1}{2}\right)$

7) $s(t)=2t^{2}-\frac{1}{6}t^{3}+8t$

8) $f(x)=\frac{4}{3}x^{3}-x+2$

9) $f(x)=3e^{x}+\frac{1}{2}x^{2}+1$