Section 5.5: The Substitution Rule

Problem 1. Evaluate the indefinite integral.

(a) $\displaystyle\int \cos^3(\theta)\sin(\theta)\,d\theta$, (b) $\displaystyle\int \frac{\sin(2x)}{2+\cos^2(x)}\,dx$, (c) $\displaystyle\int x\sqrt{x+2}\,dx$.

Problem 2. Evaluate the definite integral.

(a) $\displaystyle\int_1^2 \frac{e^{1/x}}{x^2}\,dx$,

(b) $\displaystyle\int_{-\pi}^{\pi} \sin^2(\theta)\cos(\theta)\,d\theta$,

(c) $\displaystyle\int_{-\pi/2}^{\pi/2} \left(x^3 + \frac{1+x^2}{\sin(x)} \right)\,dx$.

Section 6.1: Areas Between Curves

Problem 3. Sketch the region enclosed by the given curves. Decide whether to integrate with respect to x or y and find the area of the region.

(a) $y = \sqrt[3]{2x}$, $y = \dfrac{1}{2}x$, 　　(b) $4x + y^2 = 12$, $x = y$, 　　(c) $y = (x-2)^2$, $y = x$, $x = 1$, $x = 3$.

Problem 4. Two cars, A and B, start side by side and accelerate from rest. The figure below shows the graphs of their velocity functions.
(a)   Which car is ahead after one minute? Explain.
(b)   What is the meaning of the area of the shaded region?
(c)   Which car is ahead after 1.5 minutes? Explain.