8. (Section 5.5) Compute $\int_0^1 e^{x+e^x}\,dx$.

   a. $e(e^{e-1}-1)$

   b. $e^{e^{e^e}}$

   c. e^{e-1}

   d. e^e

   e. $(e-1)e^{e-1}$

9. (Section 6.1) Which of the following represents the area between the two curves $y=\sin(x)$ and $y=\cos(x)$ in the interval $0\le x\le \frac{\pi}{2}$?

   a. $\displaystyle\int_0^{\pi/2}\Big(\sin(x)-\cos(x)\Big)\,dx$

   b. $\displaystyle\int_0^{\pi/2}\Big(\cos(x)-\sin(x)\Big)\,dx$

   c. $\displaystyle\frac{1}{\pi/2}\int_0^{\pi/2}\Big(\sin(x)+\cos(x)\Big)\,dx$

   d. $\displaystyle\int_0^{\pi/4}\Big(\cos(x)-\sin(x)\Big)\,dx+\int_{\pi/4}^{\pi/2}\Big(\sin(x)-\cos(x)\Big)\,dx$

10. (Section 6.2) The definite integral $\int_0^4 \pi y\,dy$ represents the volume of which of the following solids?

    a. The region bounded by the y-axis, $x=\sqrt{y}$, and $y=2$, rotated about the y-axis

    b. The region bounded by the y-axis, $x=\sqrt{y}$, and $y=4$, rotated about the y-axis

    c. The region bounded by the x-axis, $y=\sqrt{x}$, and $x=2$, rotated about the x-axis

    d. The region bounded by the x-axis, $y=\sqrt{x}$, and $x=16$, rotated about the x-axis

11. (Section 6.5) Which of the following represents the average of the function $f(x)=\cos^2(x^2)$ over the interval from $x=0$ to $x=\pi/2$?

    a. $\frac{2}{\pi}\int_0^{\pi/2} f(x)\,dx$

    b. $\int_0^{\pi/2} f'(x)\,dx$

    c. $\displaystyle\frac{f(\pi/2)-f(0)}{\pi/2}$

    d. $\sqrt{f(\pi/2)f(0)}$

12. (Section 7.1) Using integration by parts, we see that $\int x\ln x\,dx$ is equal to which of the following?

    a. $\displaystyle\frac{x^2\ln x}{2}-\int\frac{x}{2}\,dx$

b. $\dfrac{x^3}{2} - \displaystyle\int \frac{x^2}{2}\,dx$

c. $\dfrac{x^3 \ln x}{2} - \displaystyle\int 1\,dx$

d. $\dfrac{x^2}{2} - \displaystyle\int \ln x\,dx$

13. (Section 7.3) While solving a trigonometric substitution question, we find $x = \tan\theta$, where $0 < \theta < \pi/2$. Which of the following is equal to $\cos(\theta)$?

a. $\sqrt{x^2 - 1}$

b. $\frac{1}{x} + \frac{1}{x+1}$

c. $\frac{1}{\sqrt{x^2+1}}$

d. $\frac{x^2-1}{\sqrt{2}}$

14. (Section 7.3) To compute the definite integral $\int_0^2 \sqrt{9 - x^2}\,dx$, which of the following substitutions could be used?

a. $x = 3\sin(\theta)$ and $dx = 3\cos(\theta)\,d\theta$

b. $x = 3\tan(\theta)$ and $dx = 3\sec^2(\theta)\,d\theta$

c. $x = 3\sec(\theta)$ and $dx = 3\sec(\theta)\tan(\theta)\,d\theta$

d. $x = 9 - \theta^2$ and $dx = -2\theta\,d\theta$

15. (Section 7.8) What is wrong with the computation

$$\int_{-1}^{1} \frac{1}{x}\,dx = \ln|x|\Big]_{-1}^{1} = \ln(1) - \ln(1) = 0?$$

a. The function $\ln|x|$ is not an antiderivative of $\frac{1}{x}$.

b. The function $\frac{1}{x}$ has an asymptote at $x = 0$ so we should have used an improper integral.

c. We are missing a "$+C$", so the final answer should be $0 + C = C$.

d. The value $\ln(1)$ is not defined, so we can't say $\ln(1) - \ln(1) = 0$.

16. (Section 11.4) Consider the series

$$A\colon \sum_{k=1}^{\infty} \frac{1}{2k-1} \text{ and } B\colon \sum_{k=1}^{\infty} \frac{1}{3k+1}.$$

Which of the following is the true statement?

a. Both series converge.

b. Both series diverge.

c. Series A converges and series B diverges.