1. Evaluate the integral:

$$\int_0^2 x^2\sqrt{4-x^2}\ dx$$

A. $\pi/2$

B. π

C. 2π

D. 4π

E. 8π

2. $\displaystyle\int \frac{dx}{4-x^2}$

A. $\dfrac{1}{2}\ \dfrac{\ln|2+x|}{\ln|2-x|} + C$

B. $\dfrac{1}{2}\ \ln|2-x| - \dfrac{1}{2}\ln|2+x| + C$

C. $\dfrac{1}{2}\ \ln|2+x| - \dfrac{1}{2}\ln|2-x| + C$

D. $\dfrac{1}{4}\ \ln|2+x| - \dfrac{1}{4}\ln|2-x| + C$

E. $\dfrac{1}{4}\ \ln|2-x| - \dfrac{1}{4}\ln|2+x| + C$

3. The Trapezoidal Rule approximation of

$$\int_0^{\frac{1}{2}} \sin(x^2)dx \quad \text{with} \quad n = 3$$

is given by

A. $\frac{1}{6}(\sin 0^2 + \sin\frac{1}{6^2} + \sin\frac{1}{3^2})$

B. $\frac{1}{12}(\sin 0^2 + 2\sin\frac{1}{6^2} + 2\sin\frac{1}{3^2} + \sin\frac{1}{2^2})$

C. $\frac{1}{8}(\sin 0^2 + \sin\frac{1}{6^2} + \sin\frac{1}{3^2} + \sin\frac{1}{2^2})$

D. $\frac{1}{12}(2\sin 0^2 + 2\sin\frac{1}{6^2} + 2\sin\frac{1}{3^2} + 2\sin\frac{1}{2^2})$

E. $\frac{1}{12}(\sin 0^2 + 2\sin\frac{1}{6^2} + 4\sin\frac{1}{3^2} + 2\sin\frac{1}{2^2})$

4. Which of the following is the most suitable substitution to evaluate the integral

$$\int \sqrt{6 + x^2}\ dx$$

A. $x = \sqrt{6}\tan\theta$

B. $x = 6\sec\theta$

C. $x = \sqrt{6}\sec\theta$

D. $x = 6\sin\theta$

E. $x = \sqrt{6}\sin\theta$

5. Evaluate the integral below, if it converges

$$\int_{\sqrt{e}}^{\infty} \frac{dx}{x(\ln x)^5}$$

A. $\frac{1}{2}$

B. 1

C. 2

D. 4

E. Diverges

6. The form of the partial fraction decomposition for $\dfrac{1}{x^3(x^2+4)^2(x-2)}$ is

A. $\dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{C}{x^3} + \dfrac{D}{x^2+4} + \dfrac{E}{(x^2+4)^2} + \dfrac{F}{x-2}$

B. $\dfrac{A}{x^3} + \dfrac{Bx+C}{x^2+4} + \dfrac{Dx+E}{(x^2+4)^2} + \dfrac{F}{x-2}$

C. $\dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{C}{x^3} + \dfrac{Dx+E}{x^2+4} + \dfrac{Fx+G}{(x^2+4)^2} + \dfrac{H}{x-2}$

D. $\dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{C}{x^3} + \dfrac{Dx+E}{x^2+4} + \dfrac{F}{x-2}$

E. $\dfrac{A}{x^3} + \dfrac{Bx+C}{x^2+4} + \dfrac{Dx^3+Ex^2+Fx+G}{(x^2+4)^2} + \dfrac{H}{x-2}$

7. Find the length of the curve, $y = \ln(\cos x),\ 0 \le x \le \dfrac{\pi}{4}$.

A. $\ln\sqrt{3}$

B. $\ln(\sqrt{3}+1)$

C. $\ln(\sqrt{3}+2)$

D. $\ln\sqrt{2}$

E. $\ln(\sqrt{2}+1)$

8. Which integral represents the area of the surface obtained by revolving the curve, $y = e^{2x},\ 0 \le x \le 1$, about the y–axis?

A. $\displaystyle\int_0^1 2\pi x e^{2x}\ dx$

B. $\displaystyle\int_0^1 2\pi x\sqrt{1+e^{4x}}\ dx$

C. $\displaystyle\int_0^1 2\pi x\sqrt{1+4e^{4x}}\ dx$

D. $\displaystyle\int_0^1 2\pi e^{2x}\sqrt{1+e^{4x}}\ dx$

E. $\displaystyle\int_0^1 2\pi e^{2x}\sqrt{1+4e^{4x}}\ dx$

9. Which of the following represents the y–coordinate of the centroid of the bounded region bounded by $y = \sin x,\ y = \cos x,\ x = 0$, and $x = \frac{\pi}{4}$, where A is the area of the region?

A. $\displaystyle \frac{1}{A}\int_0^{\frac{\pi}{4}} \frac{1}{2}(\cos^2 x - \sin^2 x)\ dx$

B. $\displaystyle \frac{1}{A}\int_0^{\frac{\pi}{4}} \frac{1}{2}(\sin^2 x - \cos^2 x)\ dx$

C. $\displaystyle \frac{1}{A}\int_0^{\frac{\pi}{4}} x(\cos x - \sin x)\ dx$

D. $\displaystyle \frac{1}{A}\int_0^{\frac{\pi}{4}} x(\sin x - \cos x)\ dx$

E. $\displaystyle \frac{1}{A}\int_0^{\frac{\pi}{4}} \frac{1}{2}x(\cos x - \sin x)^2 dx$

10. $\displaystyle \sum_{n=1}^{\infty} \frac{2^n + 3^n}{4^n} =$

A. 1

B. 2

C. 3

D. 4

E. The series diverges.

11. Which of the following series converge?

a. $\sum_{n=1}^{\infty} \frac{3^n}{1+3^n}$

b. $\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n}}$

c. $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^2}$

A. Only a.

B. Only b.

C. Only c.

D. None of them.

E. All of them.

12. Which of the following statements are true?

I. If $\lim_{n\to\infty} |a_n| = 0$, then $\lim_{n\to\infty} a_n = 0$

II. If $\sum_{n=1}^{\infty} a_n$ converges, then $\lim_{n\to\infty} a_n = 0$

III. If $\lim_{n\to\infty} a_n = 0$, then $\sum_{n=1}^{\infty} a_n$ converges.

A. I only

B. I and II only

C. I and III only

D. II and III only

E. All of them.