1. The lower sum (in terms of n, the number of subintervals) for the region bounded by the graph of $f(x) = 4 - x^2$ and the x-axis on the interval $[0, 2]$ is

   (a) $\dfrac{4}{3n^2}\,(4n^2 - 3n - 1)$ _____(correct)

   (b) $\dfrac{2}{n^2}\,(4n^2 - 3n - 1)$

   (c) $\dfrac{3}{4n^2}\,(4n^2 + 3n - 1)$

   (d) $\dfrac{4}{3n^2}\,(4n^2 + 3n + 1)$

   (e) $\dfrac{3}{4n^2}\,(4n^2 - 3n + 1)$

2. Using the Midpoint rule with 2 rectangles, the approximate area of the region bounded by the graph of $f(x) = \cos x$ and the x-axis over the interval $\left[-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right]$ is equal to

   (a) $\dfrac{\pi}{\sqrt{2}}$ _____(correct)

   (b) $\dfrac{\pi}{2}$

   (c) $\sqrt{2}\,\pi$

   (d) $2\,\pi$

   (e) π

3. $\lim_{n\to\infty} \sum_{i=1}^{n} \left(\frac{i^4}{n^5} + \frac{i}{n^2} \right) =$

   Hint: Recognize the sum as a Riemann sum for a function defined on $[0, 1]$.

   (a) $\frac{7}{10}$ _____ (correct)

   (b) $\frac{3}{5}$

   (c) $\frac{4}{5}$

   (d) $\frac{9}{10}$

   (e) $\frac{1}{5}$

4. Consider an **odd** continuous function f such that $\int_{-3}^{6} f(x)\,dx = 9$, and $\int_{0}^{3} f(x)\,dx = -3$, then $\int_{0}^{6} f(x)\,dx =$

   (a) 6 _____ (correct)

   (b) -6

   (c) 12

   (d) -12

   (e) 0

5. The average value of $f(x) = 3x^2 + 8x$ on the interval $[-1, 2]$ is equal to

(a) 7 _____(correct)

(b) 6

(c) 5

(d) 4

(e) 3

6. If $F(x) = \int_0^{\tan x} \sqrt{t + \sqrt{t}}\, dt$, then $F'\left(\frac{\pi}{4}\right) =$

(a) $2\sqrt{2}$ _____(correct)

(b) $\sqrt{2}$

(c) $\dfrac{1}{\sqrt{2}}$

(d) $4\sqrt{2}$

(e) 1

7. $\int_0^1 x(1-x)^9\,dx =$

(a) $\frac{1}{110}$ ——————————————————————————————(correct)
(b) $\frac{1}{100}$
(c) $\frac{1}{10}$
(d) $\frac{1}{9}$
(e) $\frac{1}{101}$

8. The area of the region bounded by the graphs of $f(x) = \sin x$ and $g(x) = \frac{2}{\pi}\,x$ on the interval $[0, \pi]$ is equal to

(a) $\frac{\pi}{2}$ ——————————————————————————————(correct)
(b) $\frac{\pi}{4}$
(c) $\frac{\pi}{3}$
(d) π
(e) $2\,\pi$

9. $\displaystyle\int_{-\pi/2}^{\pi/2} \sin(7x)\,\cos(3x)\,dx =$

(a) 0 (correct)

(b) 1

(c) π

(d) $\dfrac{\pi}{4}$

(e) $\dfrac{\pi}{2}$

10. $\displaystyle\int_{1}^{4} \frac{1}{\sqrt{x}(1+\sqrt{x})}\,dx =$

(a) $2\,\ln\dfrac{3}{2}$ (correct)

(b) $\ln\dfrac{3}{2}$

(c) $2\,\ln\dfrac{2}{3}$

(d) $\ln\dfrac{2}{3}$

(e) $\ln\dfrac{4}{3}$

11. $\displaystyle\int \frac{x^2+1}{x+1}\,dx =$

(a) $\dfrac{x^2}{2} - x + 2\ln|x+1| + C$ _____(correct)

(b) $\dfrac{x^2}{2} + x - 2\ln|x+1| + C$

(c) $\dfrac{x^2}{4} - x + 2\ln|x+1| + C$

(d) $\dfrac{x^2}{2} + x + 2\ln|x+1| + C$

(e) $\dfrac{x^2}{2} - x - 2\ln|x+1| + C$

12. $\displaystyle\int_0^{\frac{1}{6}} \frac{3}{\sqrt{1-9x^2}}\,dx =$

(a) $\dfrac{\pi}{6}$ _____(correct)

(b) $\dfrac{\pi}{3}$

(c) $\dfrac{\pi}{18}$

(d) $\dfrac{\pi}{9}$

(e) $\dfrac{\pi}{2}$

13. $\displaystyle\int_0^{\ln 3} \tanh x\, dx =$

(a) $\ln \frac{5}{3}$ _____(correct)

(b) $\ln \frac{3}{5}$

(c) $\ln \frac{3}{4}$

(d) $\ln \frac{4}{3}$

(e) $\ln \frac{5}{4}$

14. The area of the region bounded by the graphs of the functions $f(x) = x(2-x)$ and $g(x) = -x$ is equal to

(a) $\frac{9}{2}$ _____(correct)

(b) 4

(c) 3

(d) $\frac{7}{2}$

(e) $\frac{5}{2}$