Calculus Final Exam
Semester 2

1. Use a simple area formula from geometry to find the area under function $A(x)$ that gives the area between the function $f(x) = 4x + 14$ and the interval $[a, x] = [-3, x]$.

   A) $\frac{1}{2}(4x+16)(x-3)$

   B) $\frac{1}{2}(4x+16)(x+3)$

   C) $\frac{1}{2}(4x+40)(x+3)$

   D) $1(x+3)$

   E) $\frac{1}{2}(4x+16)$

2. $\int 5x^6 dx =$

   A) $\frac{x^7}{7}+C$ B) $\frac{5x^6}{7}+C$ C) $\frac{5x^7}{7}+C$ D) $\frac{5x^6}{6}+C$ E) $\frac{x^6}{6}+C$

3. $\int 7x^{6/7} dx =$

   A) $\frac{7}{13}x^{13/7}+C$

   B) $\frac{49}{13}x^{13/7}+C$

   C) $\frac{7}{13}x^{13/7}+C$

   D) $\frac{6}{7x^{1/7}}+C$

   E) $\frac{49}{6}x^{13/7}+C$

4. $\int \sqrt[4]{x}\, dx =$

   A) $\frac{1}{4x^{3/4}}+C$

   B) $-\frac{4}{5}x^{5/4}+C$

   C) $-\frac{1}{4x^{3/4}}+C$

   D) $\frac{4}{5}x^{5/4}+C$

   E) $4x^{1/4}+C$

5. $\int 3x^{-3} dx =$

   A) $\frac{3}{2x^2}+C$

   B) $-\frac{1}{2x^2}+C$

   C) $-\frac{3}{2x^3}+C$

   D) $-\frac{3}{2x^4}+C$

   E) $-\frac{3}{2x^2}+C$

6. $\int 2\sin 2x \, dx =$

A) $\cos 2x + C$ D) $-\sin^2 2x + C$

B) $-\cos x + C$ E) $\sin^2 2x + C$

C) $-\cos 2x + C$

7. $\int \dfrac{4x^4 + 8x^3 + 4x^2}{x^2} \, dx =$

A) $12x^3 + 16x^2 + 4x + C$

B) $8x^2 + 8x + C$

C) $12x^3 - 16x^2 - 4x + C$

D) $\dfrac{4x^3}{3} + \dfrac{8x^2}{2} + 4x + C$

E) $\dfrac{\dfrac{4x^3}{3} + \dfrac{8x^2}{2} + 4x}{3x^3} + C$

8. $\int \dfrac{\sin x}{\cos^2 x} \, dx =$

A) $\cos x + C$ B) $\sin x + C$ C) $\sec x + C$ D) $\csc x + C$ E) $-\sec x + C$

9. Find $y(x)$ if $\dfrac{dy}{dx} = x^6$ and $y(0) = 2$.

A) $\dfrac{x^7}{7} + 2$ B) $\dfrac{x^6}{6} + 2$ C) $\dfrac{x^7}{7}$ D) $\dfrac{x^7}{7} + 3$ E) $\dfrac{x^7 + 2}{7}$

10. Find $y(x)$ if $\dfrac{dy}{dx} = x^2 - 8$ and $y(0) = 3$.

A) $\dfrac{x^3}{3} - 8x + 11$ D) $\dfrac{x^3}{3} - 8x$

B) $\dfrac{x^3}{3} - \dfrac{x}{8} + 3$ E) $\dfrac{x^2}{2} - 8x + 3$

C) $\dfrac{x^3}{3} - 8x + 3$

11. $\int 4x^3 \left(x^4 - 3\right)^8 dx =$

A) $\dfrac{\left(x^4 - 3\right)^9}{9} + C$

D) $\dfrac{\left(x^4 + 3\right)^9}{9} + C$

B) $\left(x^4 - 3\right)^9 + C$

E) $\dfrac{4x\left(x^4 - 3\right)^9}{9} + C$

C) $\dfrac{\left(x^4 - 3\right)^8}{8} + C$

12. $\int x^5 \sqrt[6]{x^6 - 5}\ dx =$

A) $\dfrac{\left(x^6 - 5\right)^{7/6}}{7}\left(6x^5 - 5\right) + C$

D) $\dfrac{\left(x^6 - 5\right)^{7/6}}{35} + C$

B) $\dfrac{\left(x^6 - 5\right)^{7/6}}{7} + C$

E) $\dfrac{\left(x^6 - 5\right)}{7} + C$

C) $\dfrac{\left(x^6 + 5\right)^{7/6}}{7} + C$

13. $\int \dfrac{x}{\sqrt{3x^2 + 3}}\ dx =$

A) $\ln |x| + C$

D) $\ln\left|\sqrt{3x^2 + 3}\right| + C$

B) $\dfrac{3}{\sqrt{3x^2 + 3}} + C$

E) $\sqrt{3x^2 + 3} + C$

C) $\dfrac{\sqrt{3x^2 + 3}}{3} + C$

14. $\int_{2}^{12} x\ dx =$

A) 70   B) –140   C) 100   D) 10   E) 71

15. $\int_{4}^{9} 6\ dx =$

A) 78   B) 30   C) 5   D) 50   E) 54

16. $\int_{-5}^{5} |11-x|\, dx =$

   A) 10   B) 110   C) –50   D) 30   E) 22

17. $\int_{-6}^{6} x\sqrt{36-x^2}\, dx =$

   A) 36   B) 72   C) 12   D) 0   E) –36

18. $\int_{\pi}^{6\pi} \frac{\pi}{6}\sin x\, dx =$

   A) –1.0472   B) –2   C) 0.5236   D) 1.0472   E) 0.2618

19. $\int_{0}^{3} x-7\, dx =$

   A) –4   B) –16.5   C) 2   D) –12   E) –18

20. $\dfrac{d}{dx}\int_{3}^{x} \dfrac{4t}{\sin t}\, dt =$

   A) $\dfrac{4x}{\sin x}$ B) $\dfrac{4x}{\sin x}+3$ C) $\dfrac{4x-3}{\sin x}$ D) $\dfrac{4x+3}{\sin x}$ E) $-\dfrac{4x}{\sin x}$

21. Find the area under the curve $y = x^2 - 6$ on [5, 10].
   A) 273.333   B) 75   C) 261.667   D) 291.667   E) 292.667

22. Find the area under the curve $f(x) = e^{3x}$ over the interval [0, 5].
   A) 1,089,673   B) 49   C) 15   D) 1,089,672   E) 3,269,017

23. Find the area under the curve $f(x) = \dfrac{1}{x+3}$ over the interval [0, 4].
   A) 1.386   B) 0.847   C) 1.946   D) 0.288   E) 19

24. $\int_{0}^{2} x^2 e^{x^3}\, dx =$

   A) 993.653   B) 2,979.958   C) 993.319   D) 2.130   E) 3,974.611

25. Find the displacement of a particle if $v(t) = \sin t$; $[0, \pi]$.
   A) 0   B) 1   C) 2   D) 2π E) π

26. Find the displacement of a particle if $v(t) = t^3 + 7$; $[0, 4]$.
   A) 284   B) 92   C) 55   D) 44   E) 71

27. Find the average value of $f(x) = \dfrac{1}{x}$ over the interval [1, 3]. Approximate value to three decimal places.

    A) 1.119   B) 10.043   C) 0.333   D) 0.549   E) 1.648

28. Find the average value of $f(x) = x^4$ over the interval [-2, 2].

    A) $\dfrac{1}{5}$ B) $\dfrac{6}{5}$ C) 16   D) $\dfrac{16}{5}$ E) 0

29. $\displaystyle\int_0^5 x\sqrt{x+7}\,dx =$

    A) 40.113   B) 34.571   C) –5.542   D) 49.883   E) –1.6

30. Integrate by parts: $\displaystyle\int xe^{3x}dx =$

    A) $\dfrac{e^{3x}}{3}(3x-1)+C$ D) $\dfrac{e^{3x}}{3}+C$

    B) $\dfrac{e^{3x}}{9}(3x-1)+C$ E) $3e^{3x}+C$

    C) $e^{3x}+C$

31. Integrate by parts: $\displaystyle\int x\cos 3x\,dx =$

    A) $\dfrac{x\sin 3x}{3}+C$ D) $\dfrac{\cos 3x}{9}+\dfrac{x\cos 3x}{3}+C$

    B) $\dfrac{\sin 3x}{3}+C$ E) $\sin 3x+C$

    C) $\dfrac{\cos 3x}{9}+\dfrac{x\sin 3x}{3}+C$

32. Integrate by Parts: $\displaystyle\int 5x\ln(6x)\,dx =$

    A) $\dfrac{5x^2\ln(6x)}{2}+\dfrac{5x^2}{4}+C$ D) $x^2\ln(6x)-x^2+C$

    B) $\dfrac{5x^2\ln(6x)}{2}-\dfrac{5x^2}{4}+C$ E) $\dfrac{5x^2\ln(6x)}{4}-\dfrac{5x^2}{2}+C$

    C) $5x^2\ln(6x)-5x^2+C$

33. Answer true or false. $\displaystyle\lim_{x\to 0}\dfrac{\sin(8x)}{\sin(16x)}=\dfrac{1}{2}$.

    A) True   B) False

Answer Key

1. B
2. C
3. B
4. D
5. E
6. C
7. D
8. C
9. A
10. C
11. A
12. B
13. C
14. A
15. B
16. B
17. D
18. A
19. B
20. A
21. C
22. D
23. B
24. C
25. C
26. B
27. D
28. D
29. A
30. B
31. C
32. B
33. A