

Decide which technique applies to each integral (simplify, u-substitution, trigonometric identities, or partial fraction decomposition). Then, evaluate the integral

1. $\int \frac{1}{x^2 - 4x - 12} dx$

2. $\int \cos^2 x dx$

3. $\int \frac{11x + 17}{2x^2 + 7x - 4} dx$

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

5. $\int x e^{2x^2} dx$

6. $\int \cos^4 x \sin x dx$

7. $\int \frac{x+3}{(x^2+6x+1)^3} dx$

8. $\int \frac{e^x}{1+e^{2x}} dx$

9. $\int \sin^5 x$

10. $\int \frac{\tan^{-1} x}{1+x^2} dx$

11. $\int \sin^2 x \cos^2 x dx$

12. $\int \frac{x^4+1}{x^2} dx$

Answer Key

1. $\frac{1}{8}\ln|x-6| - \frac{1}{8}\ln|x+2| + C$
 or $\frac{1}{8}\ln\left|\frac{x-6}{x+2}\right| + C$
 or $\ln\sqrt[8]{\left|\frac{x-6}{x+2}\right|} + C$
2. $\frac{1}{2}x + \frac{1}{4}\sin(2x) + C$
3. $\frac{5}{2}\ln|2x+1| + 3\ln|x+4| + C$
4. $\frac{1}{2}x^2 + C$
4. $\frac{1}{4}e^{2x^2} + C$
6. $-\frac{1}{5}\cos^5 x + C$
7. $-\frac{1}{4(x^2+6x+1)^2} + C$
8. $\tan^{-1}(e^x) + C$
9. $-\cos x + \frac{2}{3}\cos^3 x - \frac{1}{5}\cos^5 x + C$
10. $\frac{1}{2}(\tan^{-1} x)^2 + C$
11. $\frac{1}{8}x - \frac{1}{32}\sin(4x) + C$
12. $\frac{1}{3}x^3 - \frac{1}{x} + C$

Review

1. Let $f(x)$ be the piecewise function defined below. At $x=2$, the function is _____

$$f(x) = \begin{cases} x^2 & \text{for } x \leq 2 \\ 8 - 2x & \text{for } x > 2 \end{cases}$$

- A. Continuous but not differentiable.
 B. Differentiable
 C. Differentiable but not continuous
 D. Not continuous and not differentiable.

3. $\lim_{x \rightarrow -2} \frac{x^2 - x - 6}{x - 2}$

- A. $-\infty$
 B. 0
 C. 1
 D. 2
 E. ∞

5. Let $f(x) = \frac{3x^2 - 6x + 1}{1 - x^3}$

Find the equation of any horizontal asymptote on the graph of f .

- A. $y = -3$
 B. $y = 3$
 C. $y = 1$
 D. $y = 0$

2. $\lim_{x \rightarrow 0} \frac{\sqrt{\tan^{-1} x + 36}}{x^{\frac{3}{5}} + 2}$

- A. Does not exist
 B. 0
 C. 3
 D. 6
 E. $\frac{\sqrt{37}}{2}$

4. Assume $\lim_{x \rightarrow 6} f(x) = 8$ and $\lim_{x \rightarrow 6} g(x) = -9$.

Evaluate $\lim_{x \rightarrow 6} f(x) \frac{7\sqrt[3]{f(x)} - 6g(x)}{7 + g(x)}$

- A. 20
 B. -55
 C. -34
 D. -41

6. Evaluate $\lim_{x \rightarrow 3^+} \frac{1 - 2x}{x - 3}$

- A. $-\infty$
 B. -5
 C. 0
 D. ∞

Answer Key:

1. A 2. C 3. B 4. C 5. D 6. A