

Practice Exam for Exam 4, Math 1413, Fall 2006

1. Let $f(x) = x^4 \ln x - \frac{1}{2}x^2$. Find $f'(x)$.

A) $f'(x) = 4x^2 - x$ B) $f'(x) = 4x^3 \ln x + x^3 - x$ C) $f'(x) = 4x^3 \ln x - 1$ D) $f'(x) = x^3 - x$

2. Let $f(x) = \ln(e^x + 1)$. Find $f'(x)$.

A) $f'(x) = \frac{e^x + 1}{\ln(e^x + 1)}$ B) $f'(x) = \frac{e^x}{\ln(e^x + 1)}$ C) $f'(x) = \frac{e^x}{e^x + 1}$ D) $f'(x) = \frac{1}{e^x + 1}$

3. Let $f(x) = e^{\sqrt{x-2}}$. Find $f'(x)$.

A) $f'(x) = e^{\sqrt{x-2}}$ B) $f'(x) = \sqrt{x-2} e^{\sqrt{x-2}}$ C) $f'(x) = \frac{1}{\sqrt{x-2}} e^{\sqrt{x-2}}$ D) $f'(x) = \frac{1}{2\sqrt{x-2}} e^{\sqrt{x-2}}$

4. Let $f(x) = \ln(\ln x)$. Find $f'(x)$.

A) $f'(x) = \frac{1}{\ln x}$ B) $f'(x) = \frac{\ln x}{\ln(\ln x)}$ C) $f'(x) = \frac{1}{x \ln x}$ D) $f'(x) = \frac{1}{x}$

5. Let $\log_a 2 = 0.301$ and $\log_a 3 = 0.477$. Find $\log_a(6\sqrt{a})$.

A) 1.278 B) 0.778 C) 2.778 D) 1.778

6. Solve $e^{-t} = 100$ for t .

A) $t = -2 \ln 10$ B) $t = 2 \ln 10$ C) $t = -20$ D) $t = 20$

7. Let $f(x) = (\ln x)^2$. Find $f'(x)$.

A) $f'(x) = \frac{2 \ln x}{x}$ B) $f'(x) = \frac{\ln x}{x}$ C) $f'(x) = \frac{2 \ln x}{x}$ D) $f'(x) = \frac{\ln x}{\ln(\ln x)}$

8. Let $f(x) = \ln \frac{x+1}{x-1}$. Find $f'(x)$.

A) $f'(x) = \frac{2x}{x^2-1}$ B) $f'(x) = \frac{2}{x^2-1}$ C) $f'(x) = -\frac{2x}{x^2-1}$ D) $f'(x) = -\frac{2}{x^2-1}$

9. Let $f(x)$ be an antiderivative of $\frac{1}{\sqrt{x}}$. Find $f(4) - f(1)$.

A) 1 B) 2 C) 3 D) 4

10. Evaluate $\int e^{3x} dx$.

A) $e^{3x} + C$ B) $3e^{3x} + C$ C) $\frac{1}{3}e^{3x} + C$ D) $3xe^{3x-1} + C$

11. Evaluate $\int (x+2)^2 dx$.

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

12. Let $F(x) = \int \frac{e^x}{1+x^2} dx$. Find $F'(x)$.

- A) $\frac{e^x}{1+x^2}$ B) $\frac{e^x}{2x}$ C) $\frac{1}{1+x^2}$ D) $\frac{e^{x+1}}{x+\frac{x^3}{3}}$

13. Evaluate $\int (x + \frac{1}{x}) dx$.

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

14. Evaluate $\int_0^a (ax^2 - x^3) dx$.

- A) $\frac{a^4}{12}$ B) $\frac{7a^3}{12}$ C) $\frac{a^3}{6}$ D) $\frac{5a^3}{6}$

15. Evaluate $\int \sqrt{2x} dx$.

- A) $\sqrt{2x}\sqrt{x}$ B) $\frac{2\sqrt{2}}{3}x\sqrt{x}$ C) $\sqrt{2}x^2$ D) $\frac{1}{\sqrt{2}}x^2$

16. Using the fact that $(x \ln x)' = 1 + \ln x$, evaluate $\int_2^4 \ln x dx$.

- A) $-2 + \ln 4$ B) $2 - 3 \ln 4$ C) $-2 + 3 \ln 4$ D) $2 - \ln 4$

17. Using the fact that $(e^{\sqrt{1-x}})' = \frac{-1}{2\sqrt{1-x}}e^{\sqrt{1-x}}$, evaluate $\int_0^1 \frac{1}{\sqrt{1-x}}e^{\sqrt{1-x}} dx$.

- A) $2e - 2$ B) $2 - 2e$ C) $1 - e$ D) $e - 1$

18. Evaluate $\int_{-1}^1 (x+1)(x+2) dx$.

- A) 0 B) $\frac{14}{3}$ C) $-\frac{14}{3}$ D) $\frac{10}{3}$

19. Find the area of the graph of $y = 4 - 3x^2$ over the interval $[-1, 1]$.

- A) 4 B) 5 C) 6 D) 7

20. Let $f(x) = -x^3 + x^2 + 2x$ and $g(x) = 0$. Find the area of the shaded region. **Use the graph for Problem 18 on page 406.**

- A) $\frac{1}{2}$ B) 1 C) $\frac{3}{2}$ D) 2

21. Let $f(x) = x^3 + 3x^2 - 9x - 12$ and $g(x) = 4x + 3$. Find the area of the region enclosed by graphs of these two functions. **Use the graph for Problem 19 on page 406.**

- A) 16 B) 32 C) 64 D) 128

22. Let $f(x) = x^4 - 8x^3 + 18x^2$ and $g(x) = x + 28$. Find the area of the region enclosed by graphs of these two functions. **Use the graph for Problem 20 on page 406.**

- A) $\frac{105}{2}$ B) $\frac{115}{2}$ C) $\frac{125}{2}$ D) $\frac{135}{2}$

23. Let $f(x) = -x^2 + 4x$ and $g(x) = x^2 - 6x + 8$. Find the area of the region enclosed by graphs of these two functions. **Use the graph for Problem 21 on page 406.**

A) 6

B) 7

C) 8

D) 9

24. Let

$$f(x) = \begin{cases} 3x^2, & \text{if } x \geq 1 \\ 9, & \text{if } x < 1. \end{cases}$$

Evaluate $\int_{-1}^2 f(x) dx$.

A) 33

B) 34

C) 35

D) 36