

1. Find  $(f^{-1})'(7)$  for  $f(x) = \sqrt{x^3 + x^2 + x + 46}$ .

- a)  $\frac{5}{3}$
- b)  $\frac{7}{3}$
- c)  $\frac{4}{3}$
- d)  $\frac{8}{3}$
- e)  $\frac{1}{7}$

2. Differentiate  $y = \frac{e^x + e^{-x}}{e^x - e^{-x}}$ .

- a)  $y' = -\frac{4}{(e^x - e^{-x})^2}$
- b)  $y' = \frac{4}{(e^x + e^{-x})^2}$
- c)  $y' = -2\frac{e^{2x} + e^{-2x}}{(e^x - e^{-x})^2}$
- d)  $y' = -\frac{2}{e^{2x} + e^{-2x}}$
- e)  $y' = \frac{e^x - e^{-x}}{e^x + e^{-x}}$

3. Evaluate the integral  $\int e^x \cos(e^x) dx$ .

- a)  $-\cos(e^x) + C$
- b)  $\sin(e^x) + C$
- c)  $e^x \sin(e^x) + C$
- d)  $-\cos(e^x) + x + C$
- e)  $-e^x \sin(e^x) + C$

4. Use the properties of logarithms to expand  $\ln \sqrt{a(b^6 + c^2)}$ .

- a)  $\frac{\ln(a)}{2} + \frac{\ln(b^6 + c^2)}{2}$
- b)  $\frac{\ln(a)}{2} + \frac{\ln(6b + 2c)}{2}$
- c)  $2 \ln(a) - 2 \ln(b^6 + c^2)$
- d)  $2 \ln(a) + 2 \ln(b^6 + c^2)$
- e)  $\ln(ab^6) + \ln(ac^2)$

5. Solve  $\ln(e^x - 7) = 6$  for  $x$ .

- a)  $\ln(6) + 7$
- b)  $e^6 + 7$
- c)  $\ln(e^6 + 7)$
- d) 13
- e) 0

6. Differentiate  $G(u) = \ln \sqrt{\frac{4u+3}{4u-3}}$ .

- a)  $G'(u) = -\frac{7}{(4u+3)(4u-3)}$
- b)  $G'(u) = -\frac{12}{(4u+3)(4u-3)}$
- c)  $G'(u) = -\frac{4u-3}{4u+3}$
- d)  $G'(u) = \sqrt{\frac{4u-3}{4u+3}}$
- e)  $G'(u) = \frac{1}{2} \ln \left( \frac{4u+3}{4u-3} \right)$

7. Use logarithmic differentiation to find the derivative of the function  $y = (x)^{\left(\frac{3}{x}\right)}$ .

- a)  $y' = \frac{3y(1 + \ln x)}{x^2}$
- b)  $y' = \frac{3(1 - \ln x)}{x^2}$
- c)  $y' = \frac{3y(1 - \ln x)}{x}$
- d)  $y' = \frac{3y(1 - \ln x)}{x^2}$
- e)  $y' = \frac{y(1 - \ln x)}{x^2}$

8. Find the derivative of the function  $y = 5 \sin^{-1}(x^2)$ .

- a)  $y' = \frac{10x}{\sqrt{1-x^4}}$
- b)  $y' = \frac{2x}{\sqrt{1+x^4}}$
- c)  $y' = \frac{10x}{\sqrt{1+x^4}}$
- d)  $y' = \frac{10x}{\sqrt{1-x^2}}$
- e)  $y' = 10x \cos^{-1}(x^2)$

9. Find an equation of the tangent line to the curve  $y = 3 \arccos\left(\frac{x}{2}\right)$  at the point  $(1, 2\pi)$ .

- a)  $y = \sqrt{3}x + 2\pi - \sqrt{3}$
- b)  $y = -\sqrt{3}x + 2\pi + \sqrt{3}$
- c)  $y = \sqrt{3}x + \pi - 2\sqrt{3}$
- d)  $y = -\sqrt{3}x + \pi + 2\sqrt{3}$
- e)  $y = x - 1 - 2\pi$

10. Evaluate the integral  $\int x^2 \ln(9x) dx$ .

- a)  $\frac{1}{3}x^3 \ln(9x) - \frac{1}{9}x^3 + C$
- b)  $\frac{1}{3}x^3 \ln(9x) - \frac{1}{3}x^3 + C$
- c)  $\frac{1}{2}x^3 \ln(9x) - \frac{1}{4}x^3 + C$
- d)  $\frac{1}{3}x^3 e^{9x} + C$
- e)  $\frac{1}{3}x^3 \ln(9x) + \frac{1}{9}x^3 + C$

11. Evaluate the indefinite integral  $\int x \cos(13x) dx$ .

- a)  $\frac{2}{13}x^2 \sin(13x) + C$
- b)  $\frac{1}{169} \sin(13x) + \frac{x}{13} \cos(13x) + C$
- c)  $-\frac{x}{13} \sin(13x) + \frac{x}{169} \cos(13x) + C$
- d)  $-\frac{x}{13} \sin(13x) + \frac{1}{13} \cos(13x) + C$
- e)  $\frac{x}{13} \sin(13x) + \frac{1}{169} \cos(13x) + C$

12. Evaluate the integral  $\int \sin^3 6x \cos^2 6x dx$ .

- a)  $\frac{1}{30} \cos^5 6x - \frac{1}{18} \cos^3 6x + C$
- b)  $\frac{1}{30} \sin^5 6x - \frac{1}{18} \sin^3 6x + C$
- c)  $-\frac{1}{30} \sin^5 6x + \frac{1}{18} \sin^3 6x + C$
- d)  $-\frac{1}{30} \cos^5 6x + \frac{1}{18} \cos^3 6x + C$
- e)  $\frac{1}{12} \sin^4 6x \cos^3 6x + C$

13. Evaluate the integral  $\int \frac{1 - \sin x}{\cos x} dx$ .

- a)  $\ln(1 + \cos x) + C$
- b)  $\ln(1 - \cos x) + C$
- c)  $\ln(\sin x) + C$
- d)  $\ln(1 + \sin x) + C$
- e)  $\ln(\cos x) + C$

14. Write out the form of the partial fraction decomposition of the function  $\frac{t^4 + t^2 + 5}{(t^2 + 2)(t^2 + 8)^2}$ .

- a)  $\frac{A}{t^2} + \frac{B}{2} + \frac{Ct + D}{(t^2 + 8)}$
- b)  $\frac{At + B}{t^2 + 2} + \frac{Ct + D}{t^2 + 8}$
- c)  $\frac{A}{t^2} + \frac{B}{2} + \frac{Ct + D}{(t^2 + 8)^2}$
- d)  $\frac{At + B}{t^2 + 2} + \frac{Ct + D}{t^2 + 8} + \frac{Et + F}{(t^2 + 8)^2}$
- e)  $\frac{At + B}{t^2 + 2} + \frac{Ct + D}{(t^2 + 8)^2}$

15. (10 pts) Use long division to evaluate the integral  $\int \frac{x^3 + 3x^2 - 10x + 9}{x^2 + 3x - 10} dx$ .

16. (10 pts) Evaluate the integral  $\int \frac{1}{x^2 \sqrt{9 - x^2}} dx$ .

17. (10 pts) Evaluate  $\int_0^{\frac{\pi}{2}} e^x \sin(2x) dx$ .