Therefore

$$\boxed{5} \qquad \boxed{\lim_{x \to 0} (1 + x)^{1/x} = e}$$

25–28 □ Differentiate f and find the domain of f.

25. $f(x) = \dfrac{1}{}$

37. $y = \dfrac{\sin^2 x \tan^4 x}{(x^2 + 1)^2}$

38. $y = \sqrt[4]{\dfrac{x^2 + 1}{x^2 - 1}}$

29. If $f(x) = \dfrac{x}{\ln x}$, find $f'(e)$.

30. If $f(x) = x^2 \ln x$, find $f'(1)$.

31–32 □ Find an equation of the tangent line to the curve at the given point.

31. $y = \ln \ln x, \quad (e, 0)$

32. $y = \ln(x^2 + 1), \quad (1, \ln 2)$

33. If $f(x) = \sin x + \ln x$, find $f'(x)$. Check that your answer is reasonable by comparing the graphs of f and f'.

43. $y = (\ln x)^x$

44. $y = x^{\ln x}$

45. $y = x^{e^x}$

46. $y = (\ln x)^{\cos x}$

47. Find y' if $y = \ln(x^2 + y^2)$.

48. Find y' if $x^y = y^x$.

49. Find a formula for $f^{(n)}(x)$ if $f(x) = \ln(x - 1)$.

50. Find $\dfrac{d^9}{}(x^8 \ln x)$.