

# 5.4 $e^x$ Properties and Derivative

Pg. 352 #'s 1, 3, 5, 11, 13, 15, 33-47 odd, 67, 83.

$$1) e^{\ln x} = 4$$
$$\boxed{x = 4}$$

$$3) e^x = 12$$
$$\ln(e^x) = \ln(12)$$
$$\boxed{x = \ln(12)}$$

$$5) 9 - 2e^x = 7$$
$$-2e^x = -2$$
$$e^x = 1$$
$$\ln(e^x) = \ln(1)$$
$$\boxed{x = 0}$$

$$11) \ln x = 2$$
$$e^{\ln x} = e^2$$
$$\boxed{x = e^2}$$

$$13) \ln(x-3) = 2$$
$$e^{\ln(x-3)} = e^2$$
$$x-3 = e^2$$
$$\boxed{x = e^2 + 3}$$

$$15) \ln \sqrt{x+2} = 1$$
$$\frac{1}{2} \ln(x+2) = 1$$
$$\ln(x+2) = 2$$
$$e^{\ln(x+2)} = e^2$$
$$x+2 = e^2$$
$$\boxed{x = e^2 - 2}$$

$$33) f(x) = e^{2x}$$
$$f'(x) = e^{2x} (2)$$
$$\boxed{f'(x) = 2e^{2x}}$$

$$35) y = e^{x^{1/2}}$$
$$y' = e^{x^{1/2}} \cdot \left(\frac{1}{2} x^{-1/2}\right)$$
$$\boxed{y' = \frac{e^{\sqrt{x}}}{2\sqrt{x}}}$$

$$37) y = e^{x-4}$$
$$y' = e^{x-4} (1)$$
$$\boxed{y' = e^{x-4}}$$

$$39) y = e^x \ln x$$
$$y' = e^x \left(\frac{1}{x}\right) + \ln x (e^x (1))$$
$$\boxed{y' = \frac{e^x}{x} + e^x \ln x}$$

$$41) y = x^3 e^x$$
$$y' = x^3 (e^x) + e^x (3x^2)$$
$$\boxed{y' = x^3 e^x + 3x^2 e^x}$$

$$43) g(t) = (e^{-t} + e^t)^3$$
$$\boxed{g'(t) = 3(e^{-t} + e^t)^2 (-e^{-t} + e^t)}$$

$$45) y = \ln(1 + e^{2x})$$

$$y' = \frac{1}{1 + e^{2x}} (2e^{2x})$$

$$y' = \frac{2e^{2x}}{1 + e^{2x}}$$

$$47) y = \frac{2}{e^x + e^{-x}}$$

$$y' = \frac{(e^x + e^{-x})(0) - 2(e^x - e^{-x})}{(e^x + e^{-x})^2}$$

$$y' = \frac{-2(e^x - e^{-x})}{(e^x + e^{-x})^2}$$

$$67) f(x) = (3 + 2x)e^{-3x}$$

$$f(x) = 3e^{-3x} + 2xe^{-3x}$$

$$f'(x) = -9e^{-3x} + 2x(-3e^{-3x}) + e^{-3x}(2)$$

$$f'(x) = -9e^{-3x} - 6xe^{-3x} + 2e^{-3x}$$

$$f'(x) = -7e^{-3x} - 6xe^{-3x}$$

$$f''(x) = -7e^{-3x}(-3) - 6x(-3e^{-3x}) + e^{-3x}(-6)$$

$$f''(x) = 21e^{-3x} + 18xe^{-3x} - 6e^{-3x}$$

$$f''(x) = 15e^{-3x} + 18xe^{-3x}$$

$$83) V = 15000e^{-0.6286t}$$

$$\frac{dV}{dt} = 15000e^{-0.6286t}(-0.6286)$$

$$\frac{dV}{dt} = -9429e^{-0.6286t}$$

at $t=1$	at $t=5$
$\frac{dV}{dt} = -5028.844$	$\frac{dV}{dt} = -406.891$