

Name: \_\_\_\_\_

Section: 302 303 

1. Simplify the given expression.

a.  $t^{1/2}t^{-1/3}$     b.  $(t^{1/2})^{-1/3}$     c.  $\frac{t^{1/2}}{t^{-1/3}}$     d.  $\ln(e^{x^2})$     e.  $\ln(e \cdot x^2)$     f.  $\ln\left(\frac{e}{x^2}\right)$

a.  $t^{1/2 - 1/3} = t^{1/6}$

b.  $t^{1/2 \cdot (-1/3)} = t^{-1/6}$

c.  $t^{1/2 - (-1/3)} = t^{1/2 + 1/3} = t^{5/6}$

d.  $x^2 \ln e = x^2$

e.  $\ln e + \ln x^2 = 1 + 2 \ln x$

f.  $\ln e - \ln x^2 = 1 - 2 \ln x$

2. Find all real numbers  $x$  that satisfy the given equation.

a.  $2^{3-x} = 4^x$     b.  $10^{x^2-1} = 10^3$     c.  $\log_2 x = 3$     d.  $2 = e^{2x}$

a.  $2^{3-x} = 2^{2x} \Rightarrow 3-x = 2x \Rightarrow 3 = 3x \Rightarrow x = 1$

b.  $x^2 - 1 = 3 \Rightarrow x^2 = 4 \Rightarrow x = \pm 2$

c.  $2^{\log_2 x} = 2^3 \Rightarrow x = 8$

d.  $\ln 2 = \ln e^{2x} \Rightarrow \ln 2 = 2x \Rightarrow x = \frac{\ln 2}{2}$

3. Differentiate the given function and simplify your answer.

a.  $f(x) = 2xe^{2x}$    b.  $f(x) = x \ln x - x$    c.  $f(x) = \ln(x^2 + 1)$    d.  $f(x) = \ln\left(\frac{x+1}{x-1}\right)$

a.  $f'(x) = 2e^{2x} + 2x e^{2x} \cdot 2 = 2e^{2x}(1 + 2x)$

b.  $f'(x) = \ln x + x \cdot \frac{1}{x} - 1 = \ln x + 1 - 1 = \ln x$

c.  $f'(x) = \frac{1}{x^2+1} (2x) = \frac{2x}{x^2+1}$

d.  $f'(x) = \left[ \ln(x+1) - \ln(x-1) \right]' = \frac{1}{x+1} - \frac{1}{x-1} = \frac{(x-1) - (x+1)}{(x+1)(x-1)} = \frac{-2}{x^2-1}$