

1. Find each derivative.

(a)  $f(x) = \sqrt{x^2 + 1}$   
 $f'(x) = \frac{1}{2}(x^2 + 1)^{-\frac{1}{2}}(2x)$   
 $= x(x^2 + 1)^{-\frac{1}{2}}$   
 $= \frac{x}{\sqrt{x^2 + 1}}$

(c)  $f(x) = (x^3 - 1)^{100}$   
 $f'(x) = 100(x^3 - 1)^{99}(3x^2)$   
 $= 300x^2(x^3 - 1)^{99}$

(b)  $f(x) = e^{x^2}$   
 $f'(x) = e^{x^2}(2x)$   
 $= 2xe^{x^2}$

(d)  $f(x) = 2^x$   
 $f'(x) = 2^x \ln 2$

2. Find an equation of the tangent line to the curve

$$f(x) = (1+2x)^{10} \quad \text{when } x = 0$$

$$f(0) = (1+2(0))^{10} = 1$$

$$f'(x) = 10(1+2x)^9(2) = 20(1+2x)^9$$

$$f'(0) = 20$$

$$y - y_1 = m(x - x_1)$$

$$y - 1 = 20(x - 0)$$

$$\boxed{y = 20x + 1}$$

3. Find an equation of the tangent line to the curve

$$f(x) = x^2 - 2^x \quad \text{when } x = 3$$

$$f(3) = 3^2 - 2^3 = 9 - 8 = 1$$

$$f'(x) = 2x - 2^x \ln 2 \implies f'(3) = 2(3) - 2^3 \ln 2 \approx 0.45$$

$$y - y_1 = m(x - x_1)$$

$$y - 1 = 0.45(x - 3)$$

$$y = 0.45x - 3(0.45) + 1$$

$$\boxed{y = 0.45x - 0.35}$$

Answers

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

(b)  $f'(x) = e^{x^2} 2x = 2xe^{x^2}$

(c)  $f'(x) = 100(x^3 - 1)^{99} 3x^2 = 300x^2(x^3 - 1)^{99}$

(d)  $f'(x) = 2^x \ln(2)$

2.  $y = 20x + 1$

3.  $y = 0.45x - 0.35$