

Worksheet 23 Answers

1)  $y' = 2x$

$y'|_{x=2} = 4$

tangent:  $y - 1 = 4(x - 2)$

normal:  $y - 1 = -\frac{1}{4}(x - 2)$

2)  $f'(x) = -2x$

$f'(2) = -4$

tangent:  $y - 2 = -4(x - 2)$

normal:  $y - 2 = \frac{1}{4}(x - 2)$

3)  $f(x) = x^{\frac{1}{2}}$

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

$f'(4) = \frac{1}{4}$

tangent:  $y - 2 = \frac{1}{4}(x - 4)$

normal:  $y - 2 = -4(x - 4)$

4)  $y' = 8x^{-3}$

$y'(2) = 1$

tangent:  $y - 1 = 1(x - 2)$

normal:  $y - 1 = -1(x - 2)$

5)  $y(1) = 13$

$y = 1 + 4x + 4x^2$

$y' = 4 + 8x$

$y'(1) = 12$

tangent:  $y - 13 = 12(x - 1)$

normal:  $y - 13 = -\frac{1}{12}(x - 1)$

6)  $y = 3x^2 - x^3$

$y(-2) = 20$

$y' = 6x - 3x^2$

$y'(-2) = -24$

tangent:  $y - 20 = -24(x + 2)$

normal:  $y - 20 = -\frac{1}{24}(x + 2)$

7)  $y' = 6x^2 + 6x - 12 = 0$

$x^2 + x - 2 = 0$

$(x + 2)(x - 1) = 0$

$x = -2; x = 1$

$y = 21; y = -6$

$(-2, 21); (1, -6)$

8)  $f(x) = x^3 + 3x^2 + x + 3$

$f'(x) = 3x^2 + 6x + 1 = 0$

$x = \frac{-6 \pm \sqrt{36 - 12}}{6} = \frac{-3 \pm \sqrt{6}}{3}$

9)  $y = x\left(x^{\frac{1}{2}}\right) = x^{\frac{3}{2}}$

$y' = \frac{3}{2}x^{\frac{1}{2}} = 3$

$x^{\frac{1}{2}} = 2$

$x = 4$

$y - 8 = 3(x - 4)$

10)

$y = ax^2 + bx + c$

$y' = 2ax + b$

slope 4 at  $x = 1 \Rightarrow 2a(1) + b = 4$

slope -8 at  $x = -1 \Rightarrow 2a(-1) + b = -8$

passes thru  $(2, 15) \Rightarrow a(2)^2 + b(2) + c = 15$

$2a + b = 4$

$\underline{-2a + b = -8}$

$2b = -4$

$b = -2$

$a = 3$

$12 - 4 + c = 15$

$c = 7$

$y = 3x^2 - 2x + 7$