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Dept: Maths  
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(1)  $y = 2x$

for tangent

$$\frac{dy}{dx} \Big|_{x=1} = 2(1)^2 = 2 \quad m=2$$

$$x_1 = 1 \quad y_1 = 2$$

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

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

$$y - 2 = 2x - 2$$

$$y = 2x - 2 + 2$$

$$y = 2x$$

for normal

$$m = -\frac{1}{m} = -\frac{1}{2}$$

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

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

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

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

$$2y + x - 4 - 1 = 0$$

$$2y + x - 5 = 0$$

$$(2) \quad y = 3x^2 - 2x$$

$$x_1 = 2 \quad y_1 = 8$$

$$= 3(2)^2 - 2(2) = 3(4) - 4$$

$$= 12 - 4 = 8$$

$$m = 8$$

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

$$y - 8 = 8(x - 2)$$

$$y - 8 = 8x - 16$$

$$y = 8x - 16 + 8$$

$$y = 8x - 8$$

for normal

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

$$y - 8 = -\frac{1}{8}(x - 2)$$

$$y - 8 = -\frac{1}{8}(x - 2)$$

$$8(y - 8) = -x + 2$$

$$8y - 64 = -x + 2$$

$$8y + x - 64 - 2 = 0$$

$$8y + x - 68 = 0$$

(3)  $y = x^3$   $x_1 = -1$   $y_1 = -1$

$$\frac{dy}{dx} = 3x^2 = 3$$

for tangent

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

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

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

$$y = 3x + 2$$

for normal

$$m = -\frac{1}{3}$$

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

$$y - (-1) = -\frac{1}{3}(x - (-1))$$

$$y + 1 = -\frac{1}{3}(x + 1)$$

$$3y + 3 = -x - 1$$

$$x + 3y + 4 = 0$$

for normal

$$m = -\frac{1}{3}$$

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

$$y - (-1) = -\frac{1}{3}(x - (-1))$$

$$y + 1 = -\frac{1}{3}(x + 1)$$

$$3y + 3 = -x - 1$$

$$x + 3y + 4 = 0$$

for tangent

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

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

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

$$y = 3x + 2$$

for normal

$$m = -\frac{1}{3}$$

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

$$y - (-1) = -\frac{1}{3}(x - (-1))$$

$$y + 1 = -\frac{1}{3}(x + 1)$$

$$3y + 3 = -x - 1$$

$$x + 3y + 4 = 0$$

for tangent

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

$$y - (-8) = 3(x - (-2))$$

$$y + 8 = 3(x + 2)$$

$$y = 3x - 4$$

for normal

$$m = -\frac{1}{3}$$

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

$$y - (-8) = -\frac{1}{3}(x - (-2))$$

$$y + 8 = -\frac{1}{3}(x + 2)$$

$$3y + 24 = -x - 2$$

$$x + 3y + 26 = 0$$

for tangent

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

$$y - (-8) = 3(x - (-2))$$

$$y + 8 = 3(x + 2)$$

$$y = 3x - 4$$

for normal

$$m = -\frac{1}{3}$$

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

$$y - (-8) = -\frac{1}{3}(x - (-2))$$

$$y + 8 = -\frac{1}{3}(x + 2)$$

$$3y + 24 = -x - 2$$

$$x + 3y + 26 = 0$$

for tangent

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

$$y - (-8) = 3(x - (-2))$$

$$y + 8 = 3(x + 2)$$

$$y = 3x - 4$$

for normal

$$m = -\frac{1}{3}$$

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

$$y - (-8) = -\frac{1}{3}(x - (-2))$$

$$y + 8 = -\frac{1}{3}(x + 2)$$

$$3y + 24 = -x - 2$$

$$x + 3y + 26 = 0$$

for tangent

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

$$y - (-8) = 3(x - (-2))$$

$$y + 8 = 3(x + 2)$$

$$y = 3x - 4$$

for normal

$$m = -\frac{1}{3}$$

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

$$y - (-8) = -\frac{1}{3}(x - (-2))$$

$$y + 8 = -\frac{1}{3}(x + 2)$$

$$3y + 24 = -x - 2$$

$$x + 3y + 26 = 0$$

$$y - 5 = -3(x - 3)$$

$$3y - 15 = -3x + 9$$

$$3y = -3x + 24$$

$$3y - 1 = 3(3x + 9)$$

$$3y = 9x + 27$$

$$3y - 9x - 1 - 27 = 0$$

$$3y - 9x - 28 = 0$$

$$3(2+2) = 3(x+5)$$

$$3(-2) = 3(x-5)$$

$$-6 = 3x - 15$$

$$3x = 9$$

$$x = 3$$

$$3(2+2) = x+5$$

$$12 = x+5$$

$$x = 7$$

$$3(2-x) + 5 = 0$$

$$6 - 3x + 5 = 0$$

$$11 - 3x = 0$$

$$3x = 11$$

$$x = \frac{11}{3}$$

$$3(2-x) + 5 = 0$$

$$6 - 3x + 5 = 0$$

$$11 - 3x = 0$$

$$3x = 11$$

$$x = \frac{11}{3}$$

for finding

$$2 - 3 = 3(x - 3)$$

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

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

$$-1 = 3x - 9$$

$$3x = 8$$

$$x = \frac{8}{3}$$

$$3(2-x) = 3(x-3)$$

$$6 - 3x = 3x - 9$$

$$-3x - 3x = -9 - 6$$

$$-6x = -15$$

$$x = \frac{15}{6} = \frac{5}{2}$$

$$3(2-x) = 3(x-3)$$

$$6 - 3x = 3x - 9$$

$$-3x - 3x = -9 - 6$$

$$-6x = -15$$

$$x = \frac{15}{6} = \frac{5}{2}$$

$$3(2-x) = 3(x-3)$$

$$6 - 3x = 3x - 9$$

$$-3x - 3x = -9 - 6$$

$$-6x = -15$$

$$x = \frac{15}{6} = \frac{5}{2}$$

$$3(2-x) = 3(x-3)$$

$$6 - 3x = 3x - 9$$

$$-3x - 3x = -9 - 6$$

$$-6x = -15$$

$$x = \frac{15}{6} = \frac{5}{2}$$