(b) the equation of the normal.

1. $y = 2x^2$

at point $(1,2)$

$y = 2(1)^2$

$= 2$

at point 2

$y = 2(2)^2$

$= 8$

2. $y = 3x^2 - 2x$

at point 2

$dy/dx = 3(2)^2 - 2(2)$

$= 12 - 4$

$= 8$

at point 8

$dy/dx = 3(8)^2 - 2(8)$

$= 3(64) - 16$

$= 192 - 16$

$= 176$

3. $y = x^3/2$

at point -1

$dy/dx = \frac{(-1)^3}{2}$

$= -1/2$

at point $-1/2$

$dy/dx = \frac{(-1/2)^3}{2}$

$= -1/6 \times 1/2$

$= -1/12$

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

at point -2

$dy/dx = 1 + (-2) - (-2)^2$

$= 1 - 2 - 4$

$= -5$

at point $-1/2$

$dy/dx = 1 + (-1/2) - (-1/2)^2$

$= 1 - 1/2 - 1/4$

$= 1/4$

5. $y = 1/x$ at the point 3

$y = 1/3$

at the point $1/3$

$y = 3$

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

at point -2

$dy/dx = 1 + 1 - 2x$

$= 2 - 2x$

$= 2 - 2(-2)$

$= 2$

at point -5

$= 2 - 2(-5)$

$= 2 + 10$

$= 12$

5. $y = 1/x$ at the point $(3, 1/3)$

$dy/dx = x^{-1}$

$= -x^{-3}$

at point 3

$= -x^{-3}$

$= -(3)^{-3}$

$= +\frac{1}{27}$

$= \frac{1}{27}$

$dy/dx = -x^{-3}$

$= -(1/3)^{-3}$

$= +\left(\frac{1}{27}\right)$

$= 1/27$

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Question

For the curves in Problem 1 to 5, at the points given, find

(a) the equation of the tangent and
(b) the equation of the normal.

1. $y = 2x^2$ at the point $(1, 2)$
2. $y = 3x^2 - 2x$ at the point $(2, 8)$
3. $y = x^3/2$ at the point $(-1, -1/2)$
4. $y = 1 + x - x^2$ at the point $(-2, -5)$
5. $y = 1/x$ at the point $(3, 1/3)$

Solution

a. The equation of the tangent:

1. $y = 2x^2$ at the point $(1, 2)$

at point 1

$$dy/dx = 4x$$
$$= 4(1)$$
$$= 4$$

at point 2

$$dy/dx = 4x$$
$$= 4(2)$$
$$= 8$$

2. $y = 3x^2 - 2x$

at point 2

$$dy/dx = 6x - 2$$
$$= 6(2) - 2$$
$$= 10$$

at point 8

$$dy/dx = 6x - 2$$
$$= 6(8) - 2$$
$$= 46$$

3. $y = x^3/2$

at point -1

$$dy/dx = 3x^2 - 0$$
$$= 3(-1)^2$$
$$= 3$$

at point $-1/2$

$$dy/dx = 3x^2$$
$$= 3(-1/2)^2$$
$$= 3(1/4)$$
$$= 3/4$$