

# Tangent and Normal Lines ... Practice Set 3

## Exercises

1. Write the equations of the tangent and the normal to the curve  $y = x^3 + 2x^2 - 4x - 3$  at the point  $(-2,5)$ .
2. Find the equations of the tangent and the normal to the curve  $y = \sqrt[3]{x-1}$  at the point  $(1,0)$ .
3. Form the equations of the tangent and the normal to the curves at the given points:
  - a)  $y = \tan 2x$  at the origin;
  - b)  $y = \arcsin[(x-1)/2]$  at the intersection with the  $x$ -axis;
  - c)  $y = \arcsin 3x$  at the intersection with the  $y$ -axis;
  - d)  $y = \ln x$  at the intersection with the  $x$ -axis;
  - e)  $y = e^{1-x^2}$  at the intersection with the straight line  $y = 1$ .
4. Write down the equations of the tangent and the normal to the curve  $x = \frac{1+t}{t^3}$ ,  $y = \frac{3}{2t^2} + \frac{1}{2t}$  at the point  $(2,2)$ .
5. Find the equations of the tangent to the curve  $x = t \cos t$ ,  $y = t \sin t$  at the origin and the point  $t = \pi/4$ .
6. Find the equations of the tangent and the normal to the curve  $x^3 + y^2 + 2x - 6 = 0$  at the point with ordinate  $y = 3$ .
7. Find the equation of the tangent to the curve  $x^5 + y^5 - 2xy = 0$  at the point  $(1,1)$ .
8. Find the equations of the tangents and normals to the curve  $y = (x-1)(x-2)(x-3)$  at its intersection with the  $x$ -axis.
9. Find the equations of the tangent and the normal to the curve  $y^4 = 4x^4 + 6xy$  at the point  $(1,2)$ .
10. Find the points at which the tangents to the curve  $y = 3x^4 + 4x^3 - 12x^2 + 20$  are parallel to the  $x$ -axis.
11. At what point are the tangent to the parabola  $y = x^2 - 7x + 3$  and the straight line  $5x + y - 3 = 0$  parallel?
12. Find the equation of the parabola  $y = x^2 + bx + c$  which is tangent to the straight line  $x = y$  at the point  $(1,1)$ .
13. Determine the slope of the tangent to the curve  $x^3 + y^3 - xy - 7 = 0$  at the point  $(1, 2)$ .
14. At what point of the curve  $y^2 = 2x^3$  is the tangent perpendicular to the straight line  $4x - 3y + 2 = 0$ ?

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## Answers

1.  $y - 5 = 0; x + 2 = 0$ . 2.  $x - 1 = 0; y = 0$ .

3. a)  $y = 2x; y = -0.5x$ ; b)  $x - 2y - 1 = 0; 2x + y - 2 = 0$ ;

c)  $6x + 2y - \pi; 2x - 6y + 3\pi = 0$ ; d)  $y = x - 1; y = 1 - x$ ;

e)  $2x + y - 3 = 0; x - 2y + 1 = 0$  for the point (1,1);  $2x - y + 3 = 0; x + 2y - 1 = 0$  for the point (-1,1).

4.  $7x - 10y + 6 = 0; 10x + 7y - 34 = 0$ . 5.  $y = 0; (\pi + 4)x + (\pi - 4)y - \frac{\pi^2\sqrt{2}}{4} = 0$ .

6.  $5x + 6y - 13 = 0, 6x - 5y + 21 = 0$ . 7.  $x + y - 2 = 0$ .

8. At the point (1,0):  $y = 2x - 2; y = \frac{1-x}{2}$ ;

at the point (2,0):  $y = -x + 2; y = x - 2$ ;

at the point (3,0):  $y = 2x - 6; y = \frac{3-x}{2}$

9.  $14x - 13y + 12 = 0; 13x + 14y - 41 = 0$ .

10. (0,20); (1,15); (-2, -12).

11. (1, -3)

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

13.  $k = -\frac{1}{11}$ .

14.  $(\frac{1}{8}, -\frac{1}{16})$ .