FIRST DERIVATIVE OF POLYNOMIAL FUNCTIONS

CANSU OLCE

A STAR MATHS (www.astarmaths.com.au)

1. $y = 3x^5 - \frac{5}{2}x^4 + \frac{3}{4}$

   $\frac{dy}{dx} = ?$

2. $y = 4x^2(3x - 2)$

   $\frac{dy}{dx} = ?$

3. $y = 2x^3 - \frac{3}{x} + 5$

   $\frac{dy}{dx} = ?$

4. $y = \frac{2}{x^3} - \frac{1}{4x} + 2$

   $\frac{dy}{dx} = ?$

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

   $\frac{dy}{dx} = ?$

6. $y = \frac{x^2 - 1}{2x}$

$\frac{dy}{dx} = ?$

7. $y = 5x^3(3 - 2x)$

$\frac{dy}{dx} = ?$

8. $y = (x^4 + 1)(4x^3 - x)$

$\frac{dy}{dx} = ?$

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

$\frac{dy}{dx} = ?$

10. $y = \frac{x^2 - 3}{x + 1}$

$\frac{dy}{dx} = ?$

11. $y = \frac{x + 1}{x^2 - 3}$

$\frac{dy}{dx} = ?$

12. $y = \frac{1}{(7 - x^3)^2}$

$\frac{dy}{dx} = ?$

13. $y = 3x - 2(1 - x)^5$

$\frac{dy}{dx} = ?$

14. Find the equation of the tangent to the curve $y = \frac{3}{x} + 2$ at the point (1,5).

15. Find the equation of the tangent to the curve $y = x - \frac{2}{x}$ at the point where the x-coordinate is 1.

16. The curve $y = \frac{1}{(3x-5)^2}$ passes through a point p where the x-coordinate is 2.

a) Find the gradient of the tangent to the curve at P.

b) Hence, find the equation of the normal to the curve at P.

17. The curve $y = px - qx^2$ has a tangent at point (-1,3). The gradient of the tangent is -4.

a) Find the values of p and q

b) Hence, find the equation of the normal to the curve at the point where the x-coordinates is 2.

18. A curve has the function $y = \frac{2x^2+1}{x}$. Find the coordinates of the points on the curve where its tangents are parallel to the straight line $2x + y - 3 = 0$.

19. A curve has the function $y = \left(\frac{x}{2} - 3\right)^2$. Find the equation of the tangent to the curve which is parallel to the straight line $x + 2y - 1 = 0$.

20. Given P(1,-1) and Q are two points on the curve $y = x(2x - 3)$ such that the normal to the curve at Q is parallel to the tangent at P. Find

a) the coordinates of point Q

b) the equation of the normal at Q.

21. The curve $y = \frac{3x-6}{1+x^2}$ intersects the x-axis at point P.

a) Find the gradient of the tangent at P.

b) Hence, find the equation of the tangent at P.

22. The curve $y = (2 - 3x)(x^2 - 1)^3$ intersects the y-axis at point Q. Find the equation of the normal at Q.

23. Find the coordinates of the point on the curve $y = 5 - \left(\frac{x}{2} + 3\right)^2$, where the tangent to the curve is parallel to the straight line $2x - y - 9 = 0$. Hence, find the equation of the normal to the curve at that point.

24. The tangent and the normal to the curve $y = x(2x + 3)^4$ at the point (-1, -1) intersects the x-axis at Q and R respectively.

a) Find the coordinates of points Q and R

b) Hence, find the area of the triangle.

ANSWERS

1. $15x^4 - 10x^3$
2. $36x^2 - 16x$
3. $6x^2 + \frac{3}{x^2}$
4. $-\frac{6}{x^4} + \frac{1}{4x^2}$
5. $\frac{6}{x^3}$
6. $\frac{1}{2} + \frac{1}{2x^2}$
7. $45x^2 - 40x^3$
8. $28x^6 - 5x^4 + 12x^2 - 1$
9. $-6x + \frac{1}{x^2} + 4$
10. $\frac{x^2+2x+3}{(x+1)^2}$
11. $\frac{-x^2-2x-3}{(x^2-3)^2}$
12. $\frac{6x^2}{(7-x^3)^3}$
13. $3 + 10(1 - x)^4$
14. $y = -3x + 8$
15. $y = 3x - 4$
16. a)-6
    b)$y = \frac{x}{6} + \frac{2}{3}$
17. a) $p = -2, q = -1$
    b) $y = -\frac{x}{2} + 1$
18. (-1/2, -3), (1/2, 3)
19. $y = -\frac{1}{2}x + \frac{11}{4}$
20. a)Q(1/2, -1)
    b)$y = x - \frac{3}{2}$
21. a)3/5
    b)$y = \frac{3}{5}x - \frac{6}{5}$
22. $y = -\frac{x}{3} - 2$
23. (-10, 1); $y = -\frac{x}{2} - 4$
24. a)Q(-8/7, 0), R(6, 0)
    b) $3\frac{4}{7}$ unit^2