

**Twelfth Grade - Differential Calculus**

1) The luminous intensity I candelas of a lamp at varying voltage V is given by: $I = 4 \times 10^{-5} V^2$.

Determine the voltage at which the light is increasing at a rate of 0.6 candelas per volt.

- 550
- 450
- 650
- 750

2) The length l meters of a certain metal rod at temperature ${}^\circ\text{C}$ is given by $l = 1 + 0.00005t + 0.0000004t^2$.

Determine the rate of change of length in $\text{mm}/{}^\circ\text{C}$ when the temperature is 100°C .

- 0.43
- 0.33
- 0.13
- 0.23

3) The distance x meters described by a car in time t seconds is given by: $x = 3t^3 - 2t^2 + 4t - 1$.

Determine the acceleration when $t = 0$.

- 7
- 4
- -7
- -4

4) Supplies are dropped from a helicopter and distance fallen in time t seconds is given by $x = 1/2gt^2$

where $g = 9.8 \text{ m/sec}^2$. Determine the velocity and acceleration of the supplies after it has fallen for 2 seconds.

- $v = 9.8 \text{ m/sec}$, $a = 19.6 \text{ m/sec}^2$
- $v = 18.6 \text{ m/sec}$, $a = 8.8 \text{ m/sec}^2$
- $v = 19.6 \text{ m/sec}$, $a = 9.8 \text{ m/sec}^2$
- $v = 19 \text{ m/sec}$, $a = 10 \text{ m/sec}^2$



5) A boy, who is standing on a pole of height 14.7m throws a stone vertically upwards. It moves in a vertical line slightly away from the pole and falls on the ground. Its equation of motion in meters and seconds is $x = 9.8 t - 4.9t^2$. Find the time taken for downward motions.

- 2
- 5
- 4
- 3

6) A ladder 10m long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of 1m/sec, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is 6m from the wall?

- 1/7
- 1/3
- 3/4
- 2/3

7) A car A is travelling from west at 50 km/hr. and car B is travelling towards north at 60 km/hr. Both are headed for the intersection of the two roads. At what rate are the cars approaching each other when car A is 0.3 kilometers and car B is 0.4 kilometers from the intersection?

- 77
- 95
- 78
- 86

8) A water tank has the shape of an inverted circular cone with base radius 2 metres and height 4 metres. If water is being pumped into the tank at a rate of $2m^3/min$, find the rate at which the water level is rising when the water is 3 m deep.

- 1/9?
- 6/5?



- 8/7?
- 8/9?

9) Find the equations of the tangent to the curve $y = x^3$ at the point (1,1)

- $y = 3x - 2$
- $y = 3x + 1$
- $y = 3x - 1$
- $y = 3x + 2$

10) Determine

$$\lim_{x \rightarrow 1} 10$$

- 15
- 17
- 10
- 11

11) Determine

$$\lim_{x \rightarrow 2} (x + 4)$$

- 6
- 3
- 4
- 5

12) Determine

$$\lim_{x \rightarrow 10} [(x^2 - 100)/(x - 10)]$$



- 45
- 20
- 35
- 25

13) Determine

$$\lim_{x \rightarrow 3} (x^2 - 9 / x + 3)$$

- 1
- 0
- 3
- 9

14) Determine

$$\lim_{x \rightarrow 3} [(x + 3) / (x^2 + 3x)]$$

- 9
- 5
- 4
- 3

15) Determine

$$\lim_{x \rightarrow 2} (3x^2 - 4x / 3 - x)$$

- 2
- 3
- 4
- 1

16) Determine



$$\lim_{x \rightarrow 4} (x^2 - x - 12 / x - 4)$$

- 6
- 5
- 4
- 7

17) Determine

$$\lim_{x \rightarrow 2} (3x + 1/3x)$$

- 32/6
- 52/6
- 57/6
- 37/6

18) Determine

$$\lim_{x \rightarrow 0} 1/x$$

- Not defined
- 0
- -1
- 1

19) Determine

$$\lim_{y \rightarrow 1} (y + 1 / y - 1)$$

- 6
- Does not exist
- 0
- 1



20) Determine

$$\lim_{h \rightarrow 0} (3h + h^2/h)$$

- 3
- 0
- -3
- Not defined

21) Determine

$$\lim_{h \rightarrow 1} (h^3 - 1/h - 1)$$

- -3
- 3
- Not defined
- 0

22) Determine

$$\lim_{x \rightarrow 3} (\sqrt{x} - \sqrt{3} / x - 3)$$

- ?3/6
- ?7/6
- ?5/6
- ?8/9

23) Given $g(x) = 3x^2$, determine the gradient of the curve at the point $x = ?1$

- 4
- -8
- -6
- 6



24) Given the function $f(x) = 2x^2 + 5x$, determine the gradient of the tangent to the curve at the point $x = 2$

- -8
- 3
- 6
- 8

25) Determine the gradient of $k(x) = ?x^3 + 2x + 1$ at the point $x = 1$

- 5
- 6
- 3
- -1

26) Given: $f(x) = ?x^2 + 7$. Find the average gradient of function f , between $x = ?1$ and $x = 3$

- -2
- 7
- 5
- 6

27) Given: $f(x) = ?x^2 + 7$, find the gradient of f at the point $x = 3$

- $-4x$
- $-8x$
- $-7x$
- $-2x$

28) Determine the gradient of the tangent to g if $g(x) = 3/x$



- $-3/a^2$
- $-6/a^2$
- $6/a^2$
- $3/a^2$

29) Determine the equation of the tangent to $H(x) = x^2 + 3x$ at $x = ?1$

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

30) Use the rules of differentiation to find the derivative of $y = 3x$?

- $12x^2$
- $5x^2$
- $15x^2$
- $3x^2$