



## 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.

- 650
- 750
- 450
- 550

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  $100^{\circ}\text{C}$ .

- 0.13
- 0.43
- 0.33
- 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  $t = 0$ .

- -4
- 4
- -7
- 7

4) Supplies are dropped from a helicopter and distance fallen in time  $t$  seconds is given by  $x = \frac{1}{2}gt^2$  where  $g = 9.8 \text{ m/sec}^2$ . Determine the velocity and acceleration of the supplies after it has fallen for 2 seconds.

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



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  $x = 9.8t - 4.9t^2$ . 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?

- 95
- 86
- 78
- 77

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  $2\text{m}^3/\text{min}$ , find the rate at which the water level is rising when the water is 3 m deep.

- $6/5?$
- $8/9?$



- $8/7?$
- $1/9?$

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

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

10) Determine

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

- 11
- 10
- 15
- 17

11) Determine

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

- 6
- 5
- 3
- 4

12) Determine

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



- 45
- 25
- 35
- 20

13) Determine

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

- 3
- 9
- 1
- 0

14) Determine

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

- 5
- 9
- 3
- 4

15) Determine

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

- 3
- 2
- 4
- 1

16) Determine



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

- 4
- 5
- 7
- 6

17) Determine

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

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

18) Determine

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

- 1
- -1
- Not defined
- 0

19) Determine

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

- Does not exist
- 6
- 1
- 0



20) Determine

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

- Not defined
- -3
- 3
- 0

21) Determine

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

- 3
- Not defined
- -3
- 0

22) Determine

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

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

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

- -8
- 4
- -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  $x = 1$

- 3
- 6
- 5
- -1

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

- 6
- -2
- 5
- 7

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

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

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  $y = 3x^2$

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