

1.) The graph on the left is of $f(x)$.

a.) Write down x-values of $f'(x) = 0$. [4 marks]

b.) Between the domain $(-\infty, 0)$, write down the interval where $f'(x)$ is positive. [2 marks]

2.) The graph above now represents $f'(x)$.

a.) Write down the x-values where $f(x)$ reaches a maximum along the domain $(-\infty, 0)$.

_____ [2 marks]

b.) Write down the x-values for the points of inflection for $f(x)$ along the domain $(-4, 4)$

_____ [2 marks]

c.) Are the gradients of the tangents for $f(x)$ positive, negative, or zero along the domain $(-3, -2)$? Explain your answer.

_____ [2 marks]

3.) The graph above now represents $f''(x)$.

a.) Write down the x-values for the points of inflection for $f(x)$ along the domain $(-4, 4)$

_____ [3 marks]

b.) Is the graph of $f(x)$ concave up, concave down, or at a point of inflection along the domain $(-1, 2)$? Explain your answer.

_____ [2 marks]

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4.) The business functions for the 3D printing business are:

Revenue: $R(x) = 1100x - 0.3x^2$ Expenses: $C(x) = 950 + 0.4x^2$

where "x" represents a 3D printer

a.) Find the profit function, $p(x)$: *[2 marks]*

b.) Find the number of 3D of printers that maximize the profit: *[2 marks]*

c.) At what price per 3D printer will the profit be maximized? *[2 marks]*

5.) Find the maximized area of the rectangle bound below the curve $f(x) = 34 - x^2$ and above the x-axis. *[4 marks]*

8.) NHRA Funny Cars have nitro-methane-fueled engines that may reach velocities above 300 mih^{-1} . [SL non-calc]

Courtney Force's Funny Car has the following velocity function:

$v(t) = -18t^2 + 180t$ where v is velocity in miles per hour and t is time in seconds

i) **Sketch** the graph of the function. [3 marks]

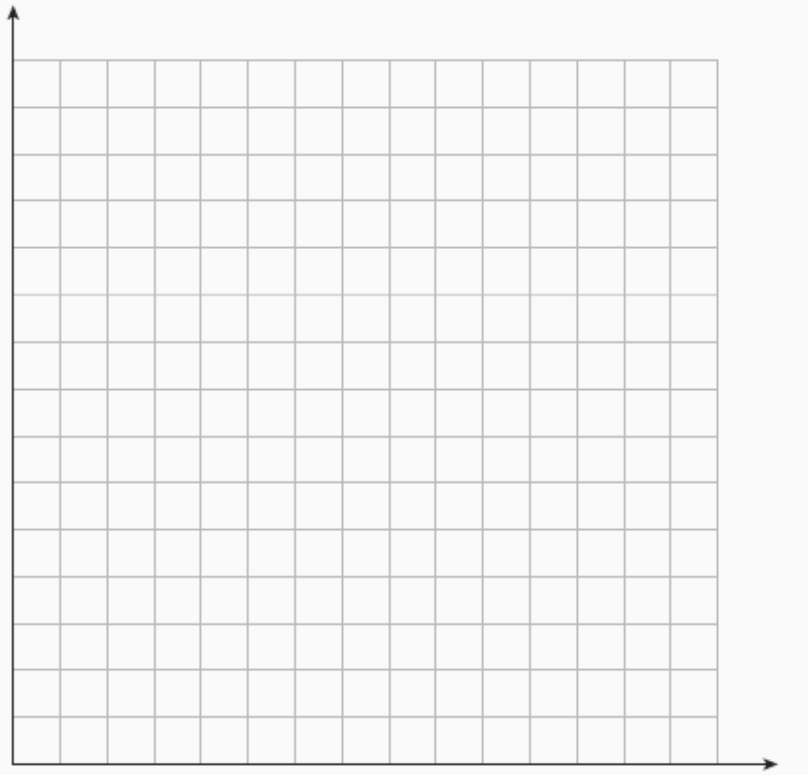
*“Sketch” is to represent by means of a **labeled** diagram that gives the shape of the the curve and includes **relevant features**.*

ii) **Find** the maximum velocity for her Funny Car. [3 marks]

iii) **Find** the equation of the tangent for her Funny Car at 2 seconds. [3 marks]

iv) **Find** the equation of the normal for her Funny Car at 2 seconds. [3 marks]

v) **State** what the derivative of the velocity function represents. [1 mark]



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Answer key (be sure to show your work for full marks)

1-3.) tutorials

4.) 786 machines; \$679,081.45

5.) $153 u^2$

6.) $w = 1.34$ ft; $l = 6.69$ ft; $h = 6.69$ ft

(after substituting the value of h , your pre-derivative equation should be $120w^2 + 480/w + 96/w$)

7.) tutorials (draw a graph with a domain -10 to 20)

8.) iii - $y = 88t + 72$