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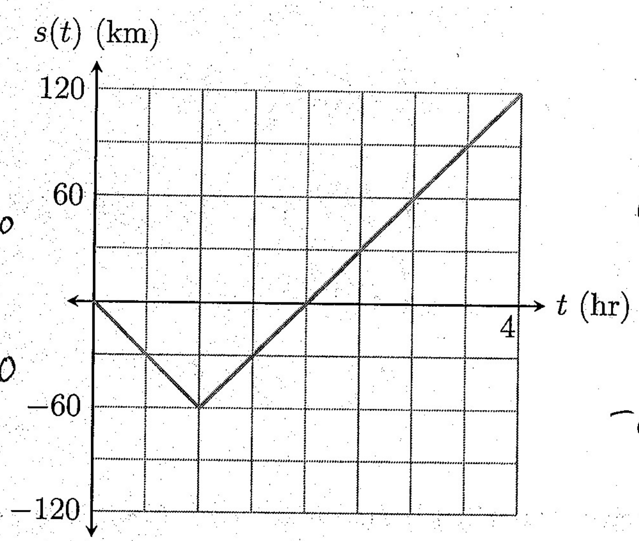
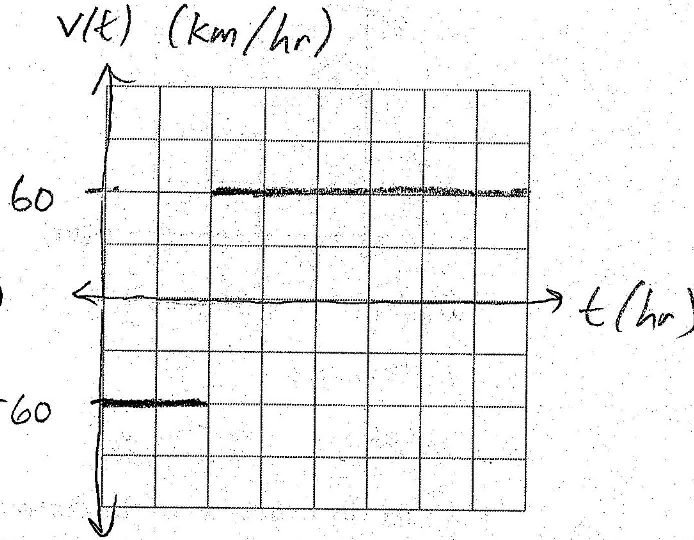
1. You are given a displacement graph below. Draw the corresponding velocity graph on the blank grid. Label axes carefully!

$\frac{-60}{1} = -60$

$\frac{180}{3} = 60$





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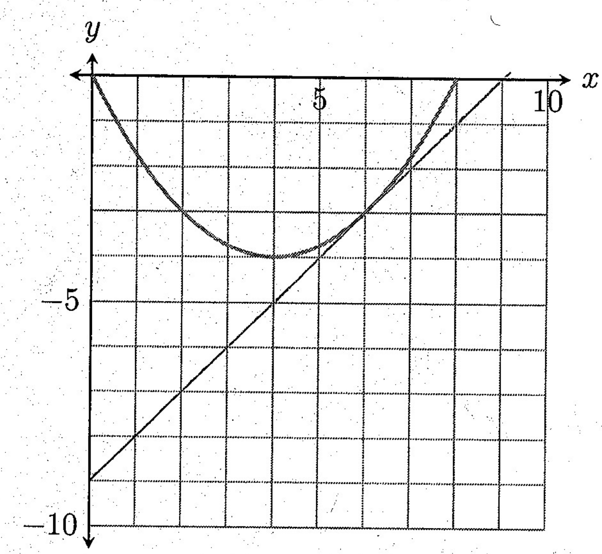
2. Consider the function $f(x) = \frac{1}{4}x^2 - 2x$, with derivative $f'(x) = \frac{1}{2}x - 2$. Find the equation of the tangent line at $x = 6$. The graph is for reference only, you must use calculus to find the equation of the line. Sketch your line to check your work.



$x = 6$

$m = f'(6) = \frac{1}{2} \cdot 6 - 2 = 1$

$f(6) = \frac{1}{4} \cdot 6^2 - 2 \cdot 6 = -3$

$y - (-3) = 1 \cdot (x - 6)$

$y + 3 = x - 6$

$y = x - 9$

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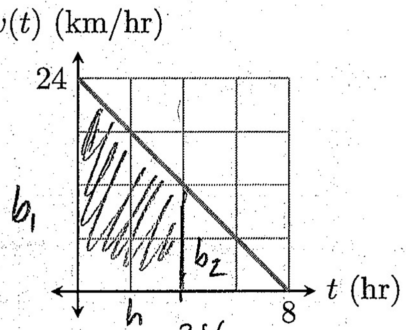
3. Below is a graph of a velocity curve. Find an equation for the displacement curve.



Slope: $\frac{-24}{8} = -3$

intercept: 24

$v(t) = -3t + 24$

Trapezoid formula:

$$s(t) = \frac{1}{2}(b_1 + b_2)h$$
$$= \frac{1}{2}(24 + (-3t + 24))t$$
$$= \frac{1}{2}(48 - 3t)t$$
$$= 24t - \frac{3}{2}t^2$$

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4. Using the definition of the derivative, find $f'(x)$ if $f(x) = 2x - x^2$. Make sure you use limit notation correctly for the last steps.

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$\frac{f(x+h) - f(x)}{h} = \frac{2(x+h) - (x+h)^2 - (2x - x^2)}{h}$$
$$= \frac{\cancel{2x} + 2h \cancel{- x^2} - 2xh - h^2 \cancel{- 2x} + \cancel{x^2}}{h}$$
$$= \frac{2h - 2xh - h^2}{h}$$
$$= \frac{h(2 - 2x - h)}{h} = 2 - 2x - h$$

$$f'(x) = \lim_{h \to 0} (2 - 2x - h) = 2 - 2x - 0 = 2 - 2x$$