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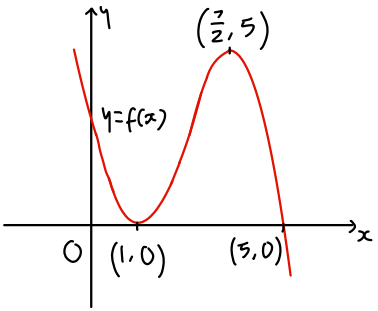
12.10 Sketching gradient functions

1.



a) Stationary points → $(1,0)$ and $(\frac{7}{2}, 5)$

b) Gradient between stationary points → positive gradient

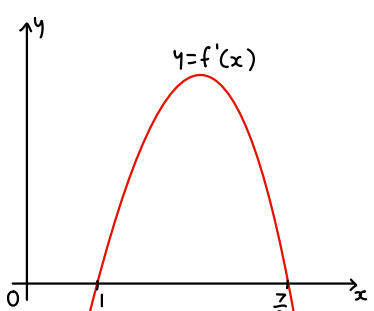
c) $x < 1$ → negative gradient

d) $x > \frac{7}{2}$ → negative gradient

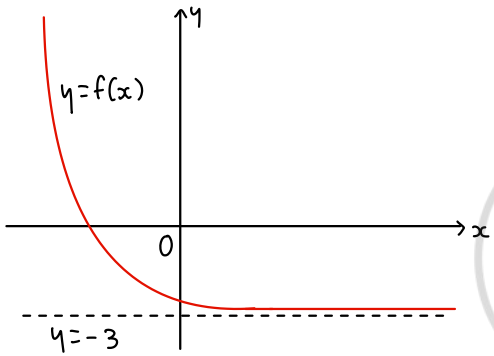
e) Stationary points at $(1,0)$ and $(\frac{7}{2}, 5)$ so $y = f'(x)$ will intersect the x-axis at $x = 1$ and $x = \frac{7}{2}$

$f(x)$ has a positive gradient between the stationary points so at that point $y = f'(x)$ will be above the x-axis

$f(x)$ has a negative gradient at $x > \frac{7}{2}$ so at that point $y = f'(x)$ will be below the x-axis



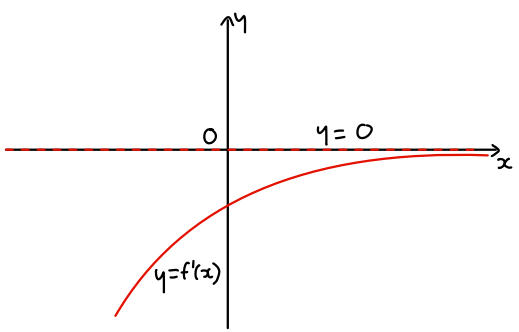
2.



a) gradient of $y = f(x)$ for all values of x

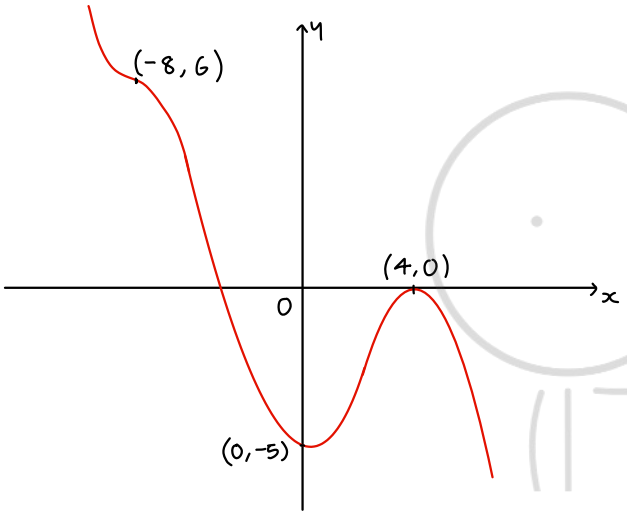
↳ The gradient is negative for all values of x.
As x increases, the gradient moves closer to zero

b) $y = f(x)$ has a negative gradient for all values of x so $y = f'(x)$ will be below the x-axis.
As x increases, the gradient will move closer to zero



3.

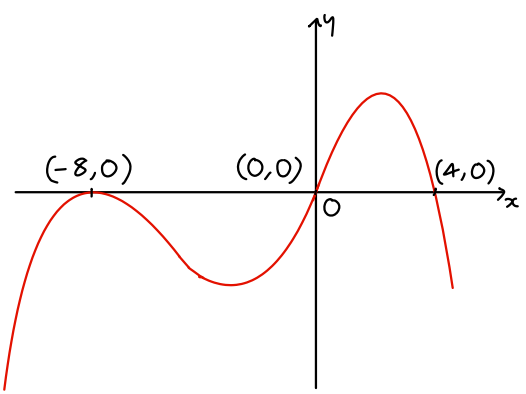
a)



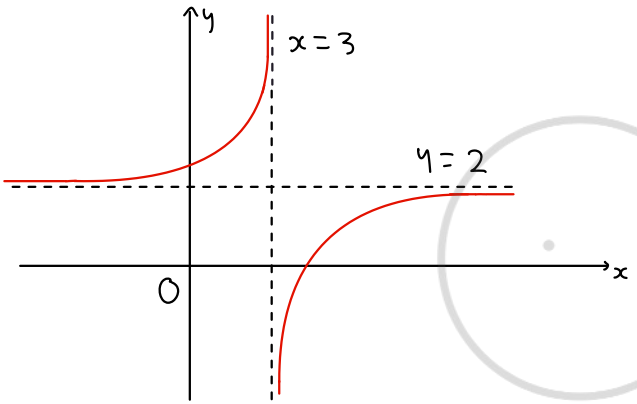
Stationary points at $(-8,6)$, $(0,-5)$ and $(4,0)$ so graph will intersect x-axis at $x=-8$, $x=0$ and $x=4$

Negative gradient between $(-8,6)$ and $(0,-5)$ and at $x>4$ so graph will be below the x-axis at those points

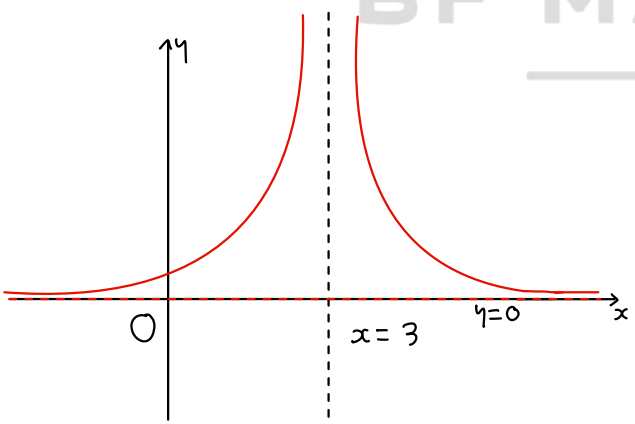
Positive gradient between $(0,-5)$ and $(4,0)$ so graph will be above the x-axis at that point



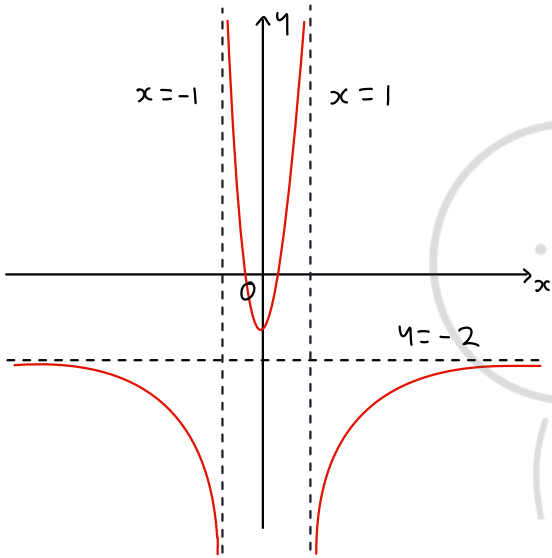
b)



Positive gradient for all values of x so graph is above x-axis with asymptote at $y = 0$ and $x = 3$

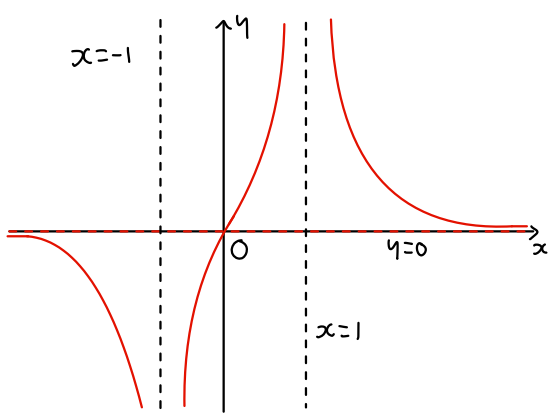


c)

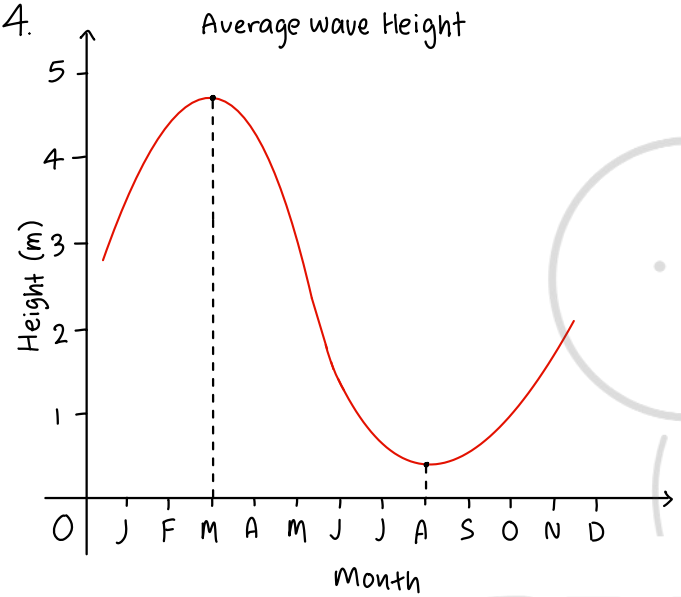


For $y = -\frac{2}{x^2}$: negative gradient at $x < 0$ so graph will be below x-axis at that point with asymptote $y=0$
positive gradient at $x > 0$ so graph will be above x-axis at that point with asymptote $y=0$

For $y = x^2 - 1$: negative gradient at $x < -1$ so graph will be below x-axis at that point with asymptote $x = -1$
positive gradient at $x > 1$ so graph will be above x-axis at that point with asymptote $x = 1$



4.



Stationary points at March and August so gradient function will intersect March and August

January to March: Positive gradient so above month axis
March to August: Negative gradient so below month axis
August to December: Positive gradient so above month axis