Week 14/15
Term 4
2022

HAWKER COLLEGE
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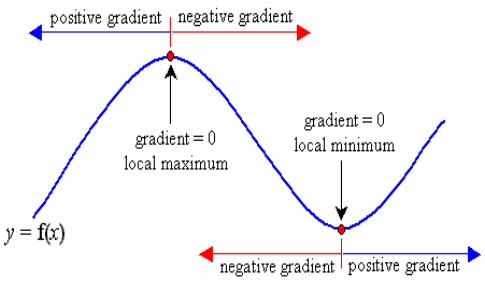
**Learning Brief**
**SMM2**

# Goals




This fortnight we are:

- Investigating primitive functions and their application

# Theoretical Components

Make notes on the following chapters and website:

**Maths Quest 11 Mathematical Methods**

- 10A - Antidifferentiation
- 10B - Deriving the original function from the gradient function

**Knowledge Checklist:**

- Applications of derivative
- Antidifferentiation

# Practical Components

**Do the following questions:**
Organise your solutions neatly in your exercise book.

You will require Chapter 10 of Maths Quest 11 Mathematical Methods (pdf – Google Classroom)

- 10A: all
- 10B: all

Mathspace task

# Investigation

See the following page (if you haven't completed it yet from Week 12/13).
Prepare a two-sided handwritten A4 summary sheet for your test.

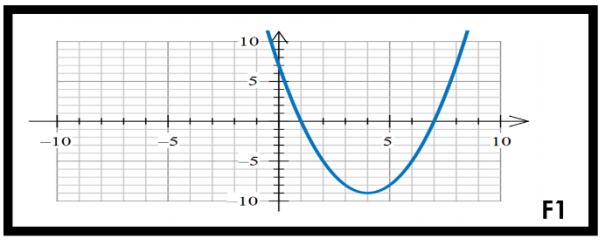
## Other

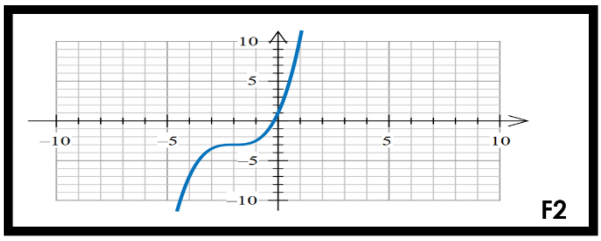
**Fun fact:** There are many functions that have antiderivatives, but for which these antiderivatives cannot be easily expressed in terms of elementary functions. One of the most well-known is the antiderivative of $\frac{1}{\ln(x)}$, often called the logarithmic integral function, written as $li(x) = \int_0^x \frac{1}{\ln(t)} dt$. This antiderivative has many important applications in physics and mathematics; in particular, $li(x)$ is used as a very good approximation to the prime-counting function $\pi(x)$ (the number of prime numbers less than or equal to $x$).

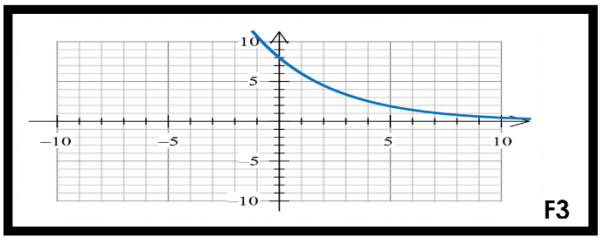
## Week 14/15 Investigation

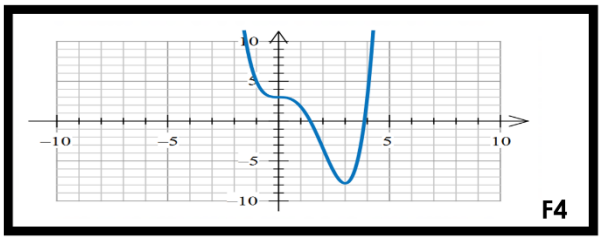
The second puzzle has a set of 12 functions graphs, 12 derivative graphs and descriptions. Cut out the puzzle pieces and then try to complete the puzzle by making 12 sets of a function, its derivative, the description for both the function and derivative, and the equation of the function. This puzzle is a good activity to complete in pairs and discuss findings or as a solitary revision activity.

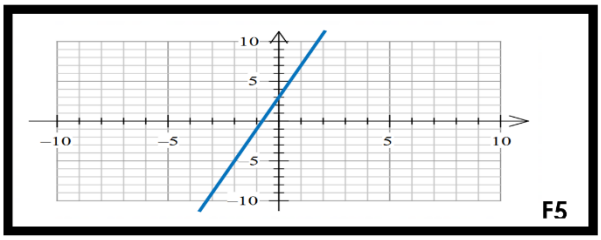
When you show me the work, make sure you have a list of first function graphs, then function descriptions, then derivative graphs and then derivative descriptions. Preferably in ascending order based on function graphs.

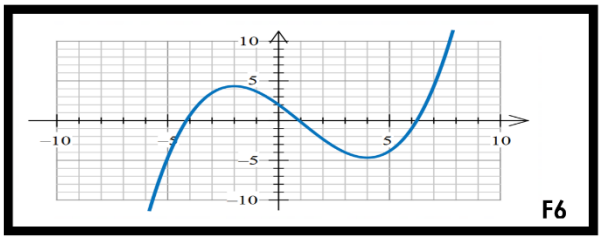


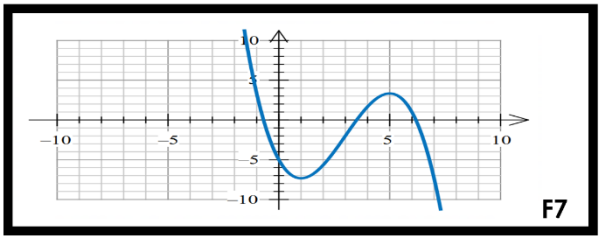



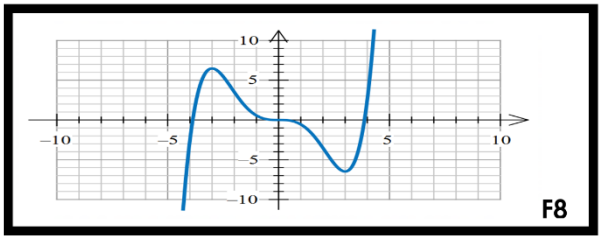



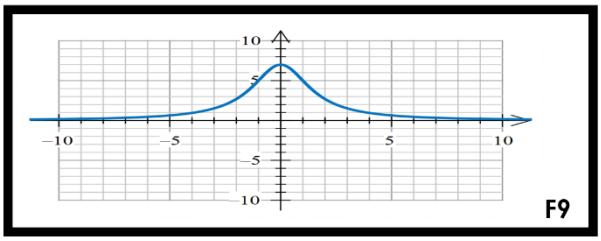



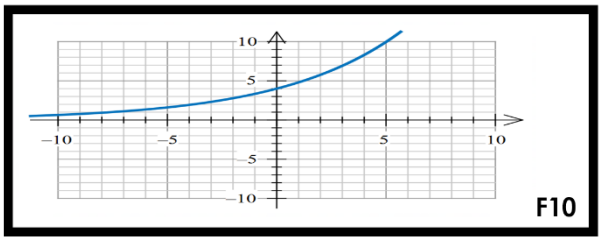



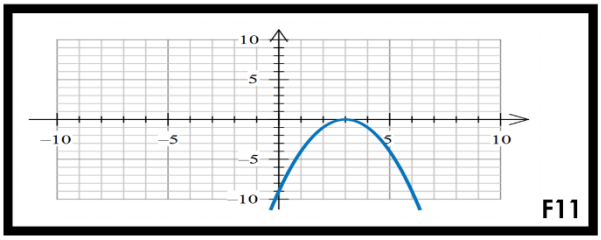



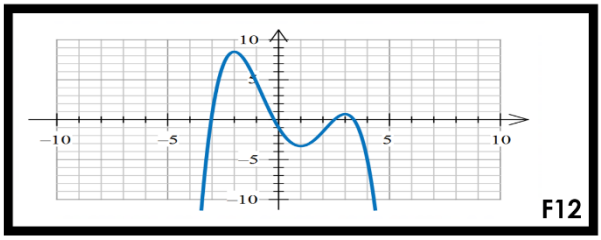



**DESCRIPTION OF FUNCTION**

This is an odd function with two stationary points and is increasing between these two points.

**f1**

**DESCRIPTION OF FUNCTION**

This is a cubic function with a single stationary point.

**f2**

**DESCRIPTION OF FUNCTION**

The equation for this function is a quadratic with only one distinct root.

**f3**

**DESCRIPTION OF FUNCTION**

This is the graph of a linear function.

**f4**

**DESCRIPTION OF FUNCTION**

An even function, with a positive leading coefficient and two stationary points.

**f5**

**DESCRIPTION OF FUNCTION**

This is an odd function that is decreasing on the interval [-3,3] and increasing elsewhere.

**f6**

**DESCRIPTION OF FUNCTION**

This even function is decreasing when $x \leq 4$, and increasing when $x \geq 4$.

**f7**

**DESCRIPTION OF FUNCTION**

This is an odd function with a positive leading coefficient and two stationary points.

**f8**

**DESCRIPTION OF FUNCTION**

This is an even function with three turning points.

**f9**

**DESCRIPTION OF FUNCTION**

This function has a maximum at $x=0$ and a horizontal asymptote of $y=0$.

**f10**

**DESCRIPTION OF FUNCTION**

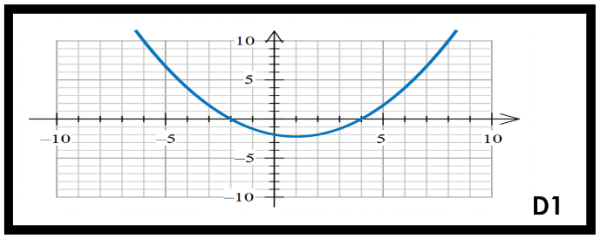
This function is always decreasing and is asymptotic to the horizontal axis.

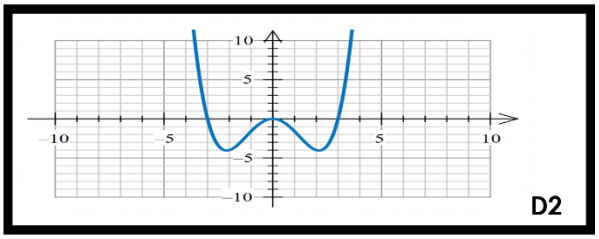
**f11**

**DESCRIPTION OF FUNCTION**

This function is always increasing and is never negative.

**f12**


D1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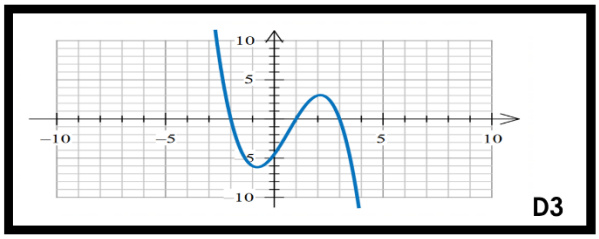
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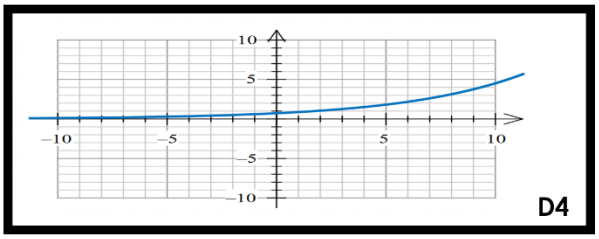
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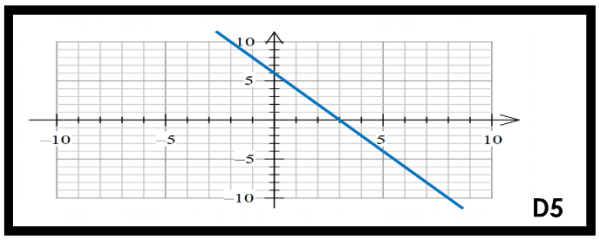
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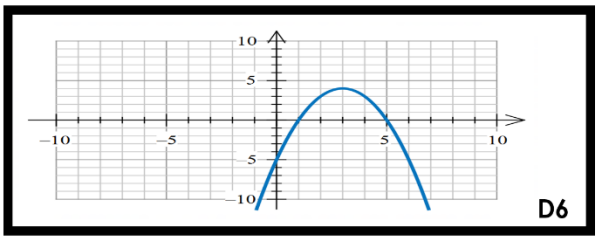
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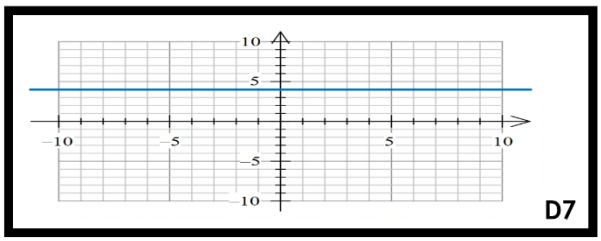
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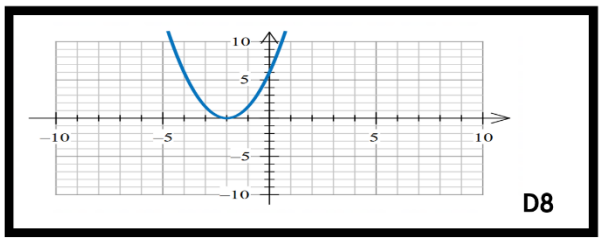
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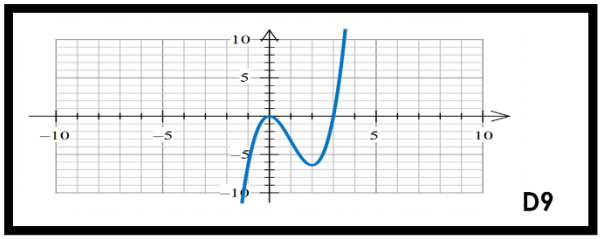
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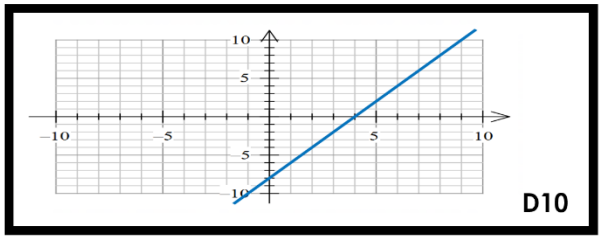
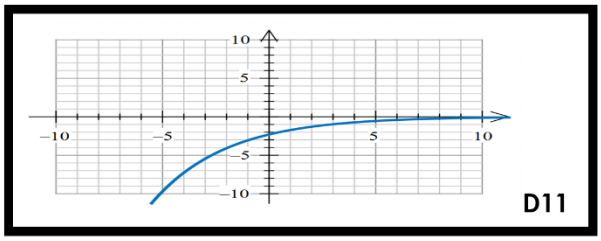

D10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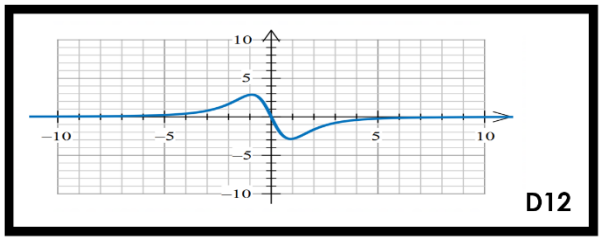
D12

**DESCRIPTION OF DERIVATIVE**

This derivative graph has an always positive and increasing slope.

**d1**

**DESCRIPTION OF DERIVATIVE**

This derivative function has zeros at x=-2, 1 and 3.

**d2**

**DESCRIPTION OF DERIVATIVE**

The graph of this derivative is not positive for all x in [–3, 3], and is symmetric to the y-axis.

**d3**

**DESCRIPTION OF DERIVATIVE**

This derivative graph is always greater or equal to zero.

**d4**

**DESCRIPTION OF DERIVATIVE**

This derivative graph is a quadratic with a negative leading coefficient.

**d5**

**DESCRIPTION OF DERIVATIVE**

This derivative graph has a horizontal asymptote and passes through the origin.

**d6**

**DESCRIPTION OF DERIVATIVE**

This derivative function is always increasing yet remains negative.

**d7**

**DESCRIPTION OF DERIVATIVE**

This derivative graph has a constant negative slope.

**d8**

**DESCRIPTION OF DERIVATIVE**

This derivative graph forms a line with a gradient of zero.

**d9**

**DESCRIPTION OF DERIVATIVE**

This derivative is an odd function with two turning points and is decreasing between these two points.

**d10**

**DESCRIPTION OF DERIVATIVE**

This derivative graph is a parabola with an axis of symmetry at x=1.

**d11**

**DESCRIPTION OF DERIVATIVE**

This derivative graph is a line that has a positive slope.

**d12**