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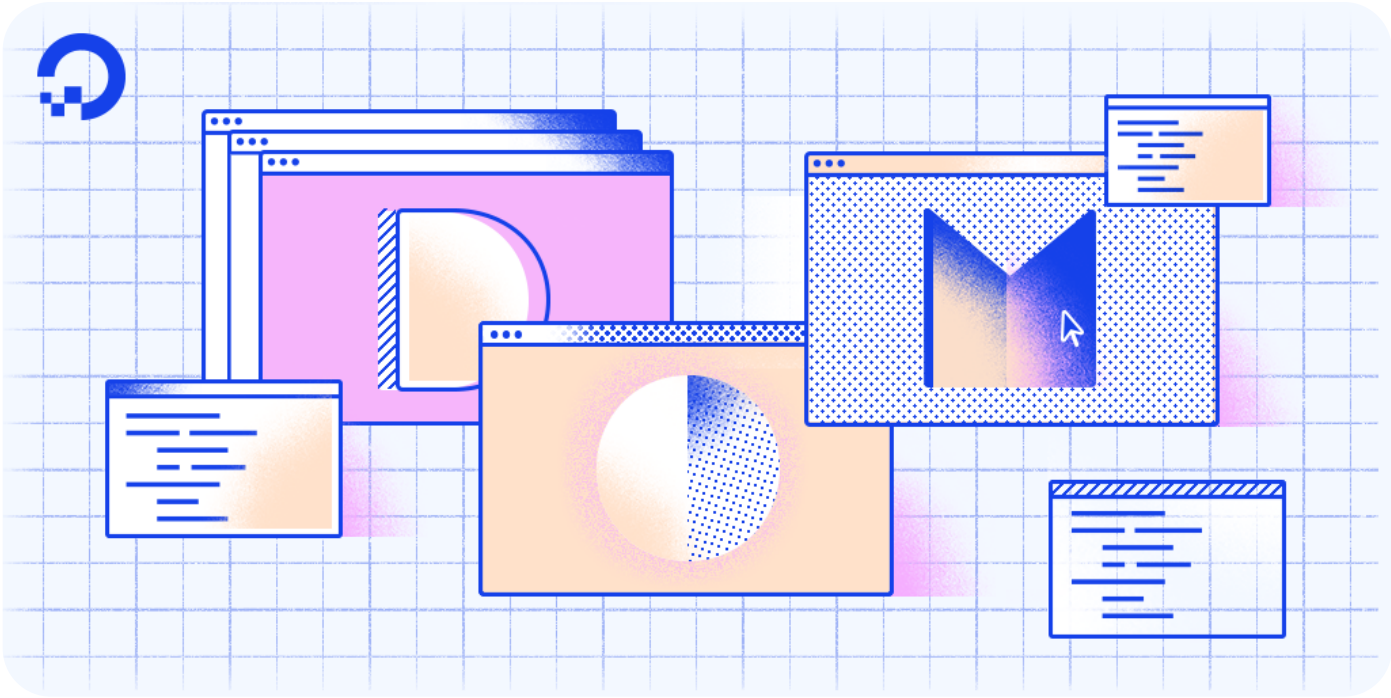
JavaScript Development

By Tania Rascia



Introduction

In the previous two installments of the Understanding the DOM series, we learned How To Access Elements in the DOM and How To Traverse the DOM. Using this knowledge, a developer can use classes, tags, ids, and selectors to find any node in the DOM, and use parent, child, and sibling properties to find relative nodes.

The next step to becoming more fully proficient with the DOM is to learn how to add, change, replace, and remove nodes. A to-do list application is one practical example of a JavaScript program in which you would need to be able to create, modify, and remove elements in the DOM.

In a static website, elements are added to the page by directly writing HTML in an `.html` file. In a dynamic web app, elements and text are often added with JavaScript. The `createElement()` and `createTextNode()` methods are used to create new nodes in the DOM.

Property/Method	Description
`createElement()`	Create a new element node
`createTextNode()`	Create a new text node
`node.textContent`	Get or set the text content of an element node
`node.innerHTML`	Get or set the HTML content of an element

To begin, let's create an `index.html` file and save it in a new project directory.

index.html

Copy

```
<!DOCTYPE html>
<html lang="en">

  <head>
    <title>Learning the DOM</title>
  </head>

  <body>
    <h1>Document Object Model</h1>
  </body>

</html>
```

Right click anywhere on the page and select "Inspect" to open up Developer Tools, then

We've created a new `p` element, which we can test out in the *Console*.

```
> console.log(paragraph)
```
Copy

```
Output
<p></p>
```

The `paragraph` variable outputs an empty `p` element, which is not very useful without any text. In order to add text to the element, we'll set the `textContent` property.

```
> paragraph.textContent = "I'm a brand new paragraph.";
> console.log(paragraph)
```
Copy

```
Output
<p>I'm a brand new paragraph.</p>
```

A combination of `createElement()` and `textContent` creates a complete element node.

An alternate method of setting the content of the element is with the `innerHTML` property, which allows you to add HTML as well as text to an element.

```
> paragraph.innerHTML = "I'm a paragraph with <strong>bold</strong> text.
```
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Note: While this will work and is a common method of adding content to an element, there is a possible cross-site scripting (XSS) risk associated with using the `innerHTML` method, as inline JavaScript can be added to an element. Therefore, it is recommended to use `textContent` instead, which will strip out HTML tags.

It is also possible to create a text node with the `createTextNode()` method.

```
> const text = document.createTextNode("I'm a new text node.");
> console.log(text)
```
Copy

With these methods, we've created new elements and text nodes, but they are not visible on the front end of a website until they've been inserted into the document.

Inserting Nodes into the DOM

In order to see the new text nodes and elements we create on the front end, we will need to insert them into the `document`. The methods `appendChild()` and `insertBefore()` are used to add items to the beginning, middle, or end of a parent element, and `replaceChild()` is used to replace an old node with a new node.

Property/Method	Description
`node.appendChild()`	Add a node as the last child of a parent element
`node.insertBefore()`	Insert a node into the parent element before a specified sibling node
`node.replaceChild()`	Replace an existing node with a new node

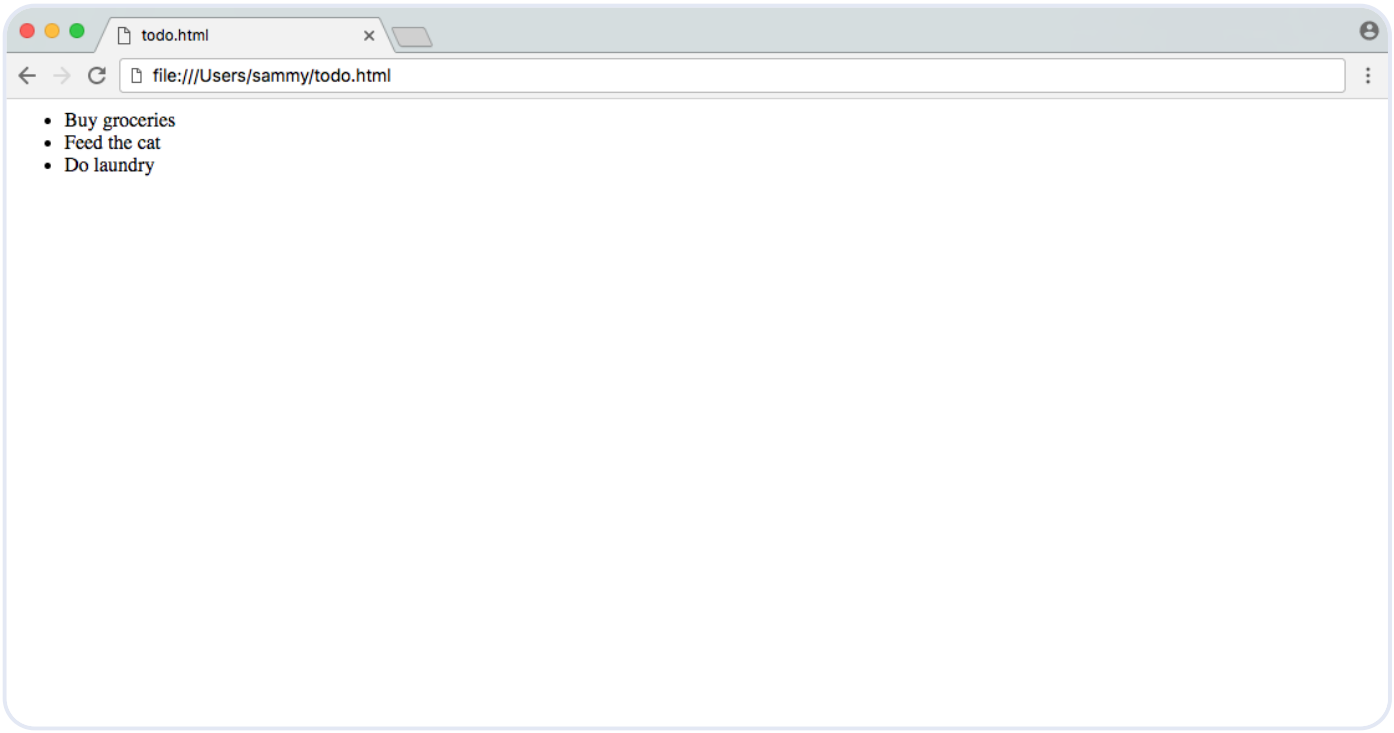
To practice these methods, let's create a to-do list in HTML:

todo.html

Copy

```
<ul>
  <li>Buy groceries</li>
  <li>Feed the cat</li>
  <li>Do laundry</li>
</ul>
```

When you load your page in the browser, it will look like this:



In order to add a new item to the end of the to-do list, we have to create the element and add text to it first, as we did in the “Creating New Nodes” section above.

```
> // To-do list ul element
> const todoList = document.querySelector('ul');
>
> // Create new to-do
> const newTodo = document.createElement('li');
> newTodo.textContent = 'Do homework';
```

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Now that we have a complete element for our new to-do, we can add it to the end of the list with `appendChild()`.

```
> // Add new todo to the end of the list
> todoList.appendChild(newTodo);
```

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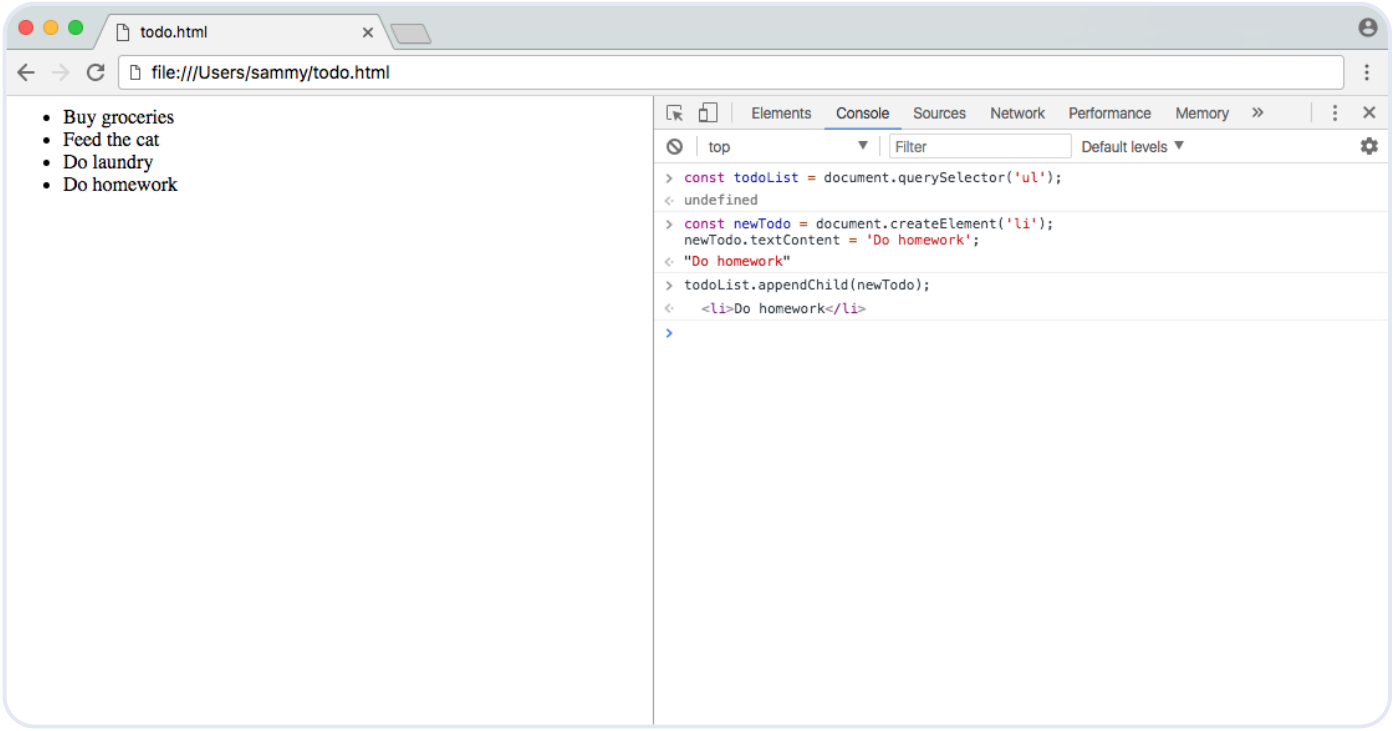
You can see the new `li` element has been appended to the end of the `ul`.

todo.html

```
  <li>Do homework</li>
</ul>
```



Maybe we have a higher priority task to do, and we want to add it to the beginning of the list. We'll have to create another element, as `createElement()` only creates one element and cannot be reused.

```
> // Create new to-do
> const anotherTodo = document.createElement('li');
> anotherTodo.textContent = 'Pay bills';
```

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We can add it to the beginning of the list using `insertBefore()`. This method takes two arguments — the first is the new child node to be added, and the second is the sibling node that will immediately follow the new node. In other words, you're inserting the new node before the next sibling node. This will look similar to the following pseudocode:

```
parentNode.insertBefore(newNode, nextSibling);
```

Copy

For our to-do list example, we'll add the new `anotherTodo` element before the first element child of the list, which is currently the `Buy groceries` list item.

todo.html

```
<ul>
  <li>Pay bills</li>
  <li>Buy groceries</li>
  <li>Feed the cat</li>
  <li>Do laundry</li>
  <li>Do homework</li>
</ul>
```

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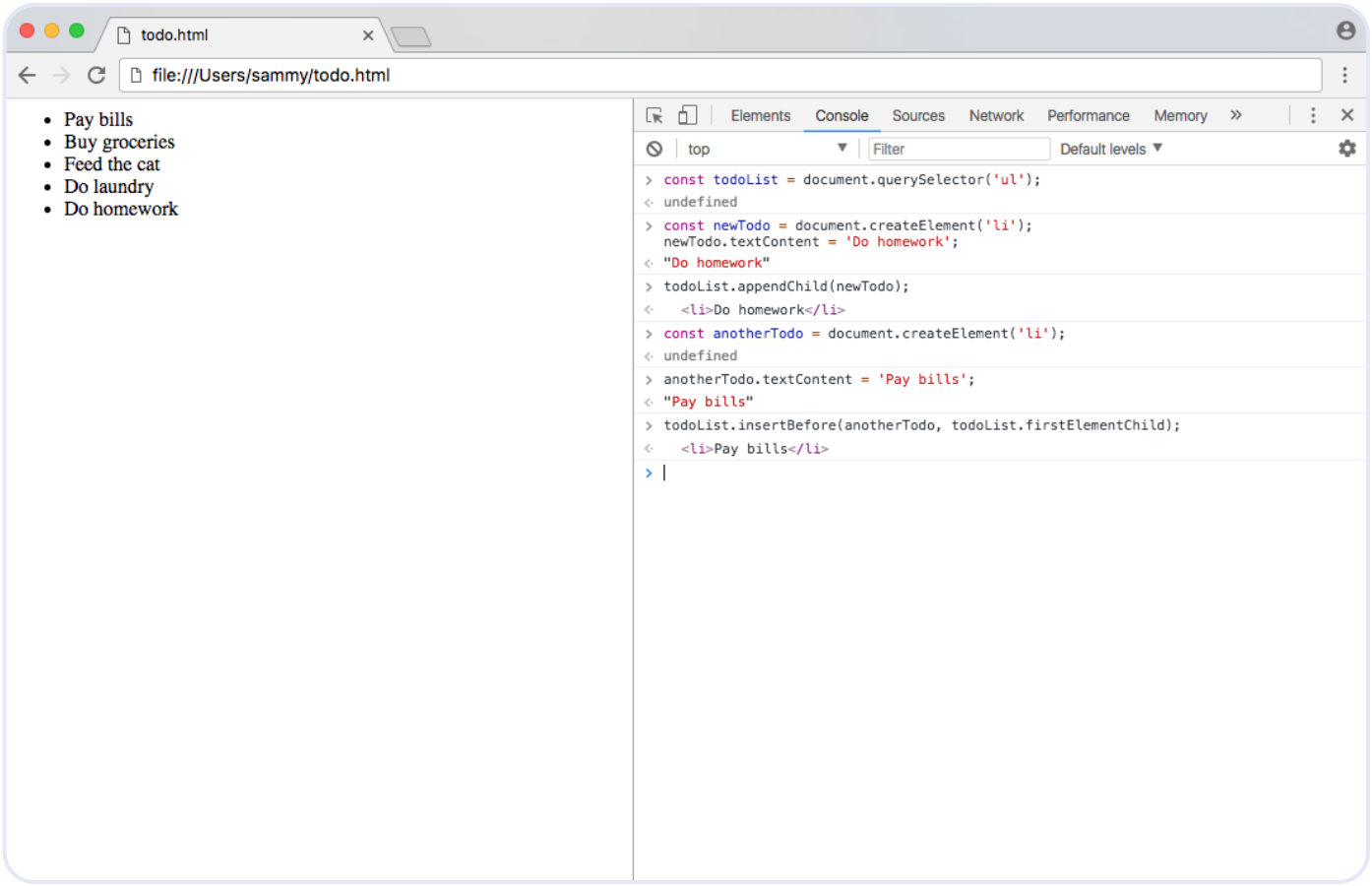

The new node has successfully been added at the beginning of the list. Now we know how to add a node to a parent element. The next thing we may want to do is replace an existing node with a new node.

We'll modify an existing to-do to demonstrate how to replace a node. The first step of creating a new element remains the same.

```
parentNode.replaceChild(newNode, oldNode);
```
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We will replace the third element child of the list with the modified to-do.

```
> // Replace existing to-do with modified to-do
> todoList.replaceChild(modifiedTodo, todoList.children[2]);
```
Copy

todo.html

```
<ul>
  <li>Pay bills</li>
  <li>Buy groceries</li>
  <li>Feed the dog</li>
  <li>Do laundry</li>
  <li>Do homework</li>
</ul>
```
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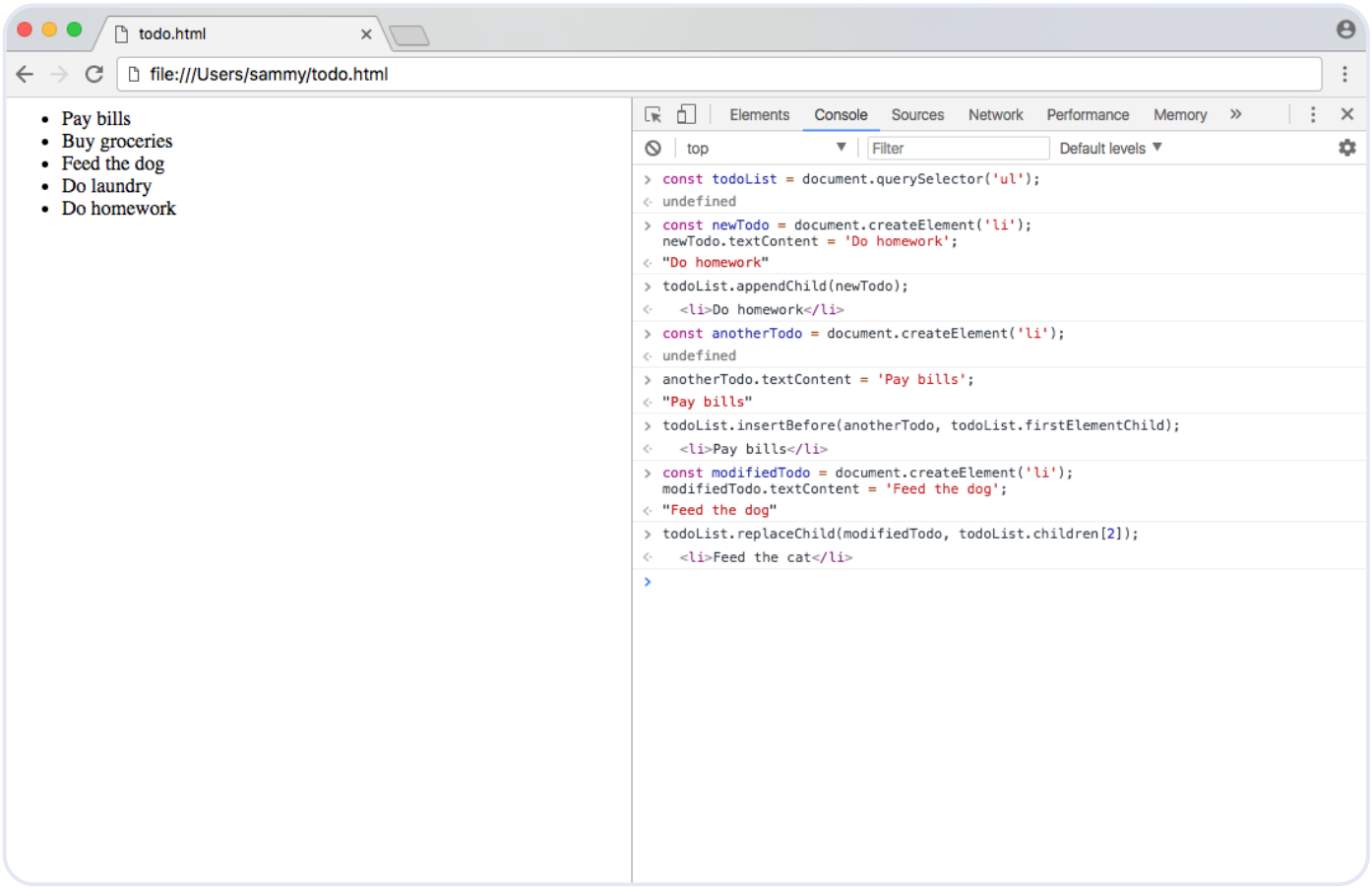

Now we know how to create elements, add them to the DOM, and modify existing elements. The final step is to learn to remove existing nodes from the DOM. Child nodes can be removed from a parent with `removeChild()`, and a node itself can be removed with `remove()`.

Method	Description
`node.removeChild()`	Remove child node
`node.remove()`	Remove node

Using the to-do example above, we'll want to delete items after they've been completed. If you completed your homework, you can remove the `Do homework` item, which happens to be the last child of the list, with `removeChild()`.

```
> todoList.removeChild(todoList.lastElementChild);
```

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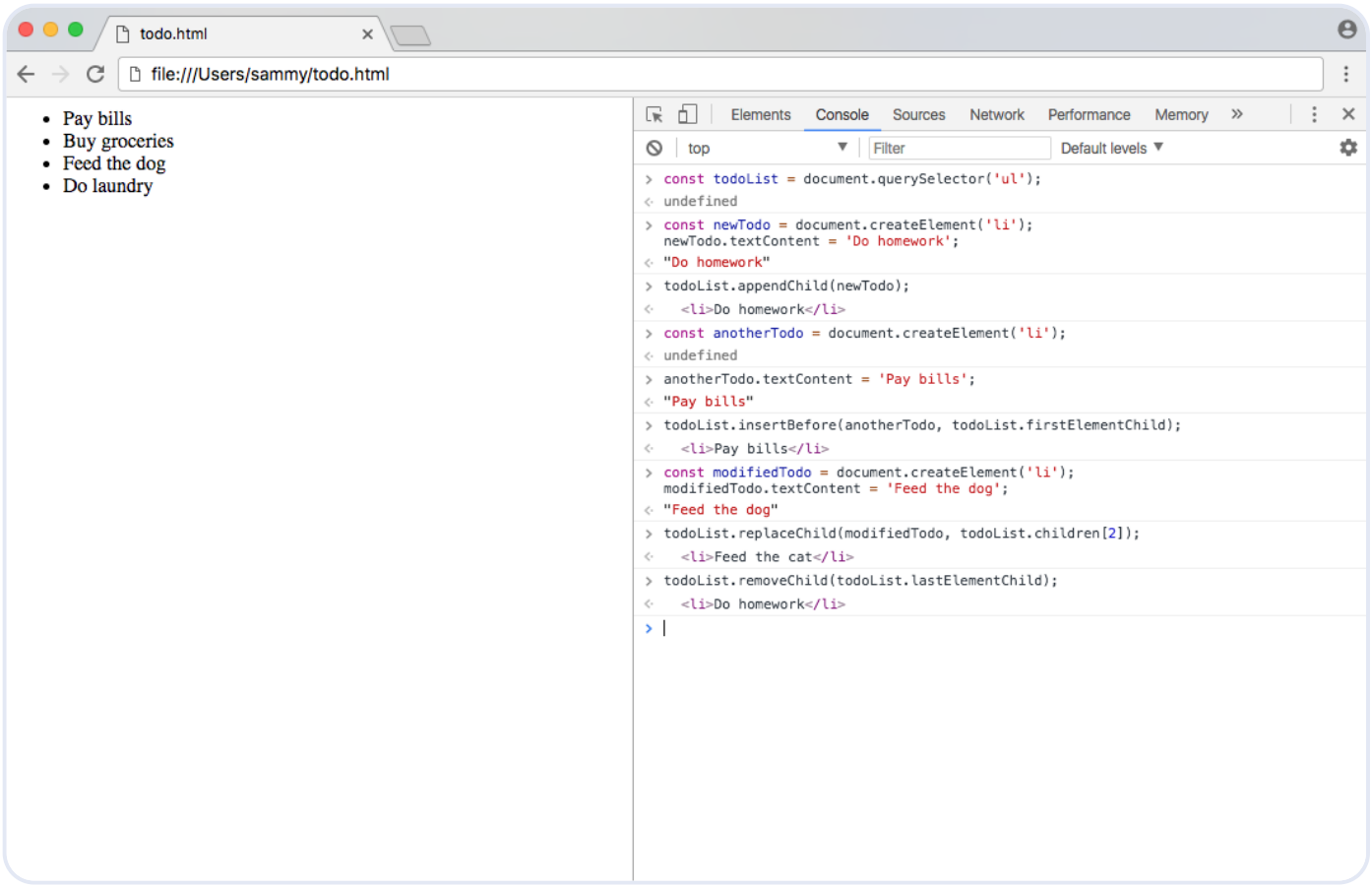
todo.html

```
<ul>
  <li>Pay bills</li>
  <li>Buy groceries</li>
  <li>Feed the dog</li>
  <li>Do laundry</li>
</ul>
```

Copy



Another method could be to remove the node itself, using the `remove()` method directly on the node.

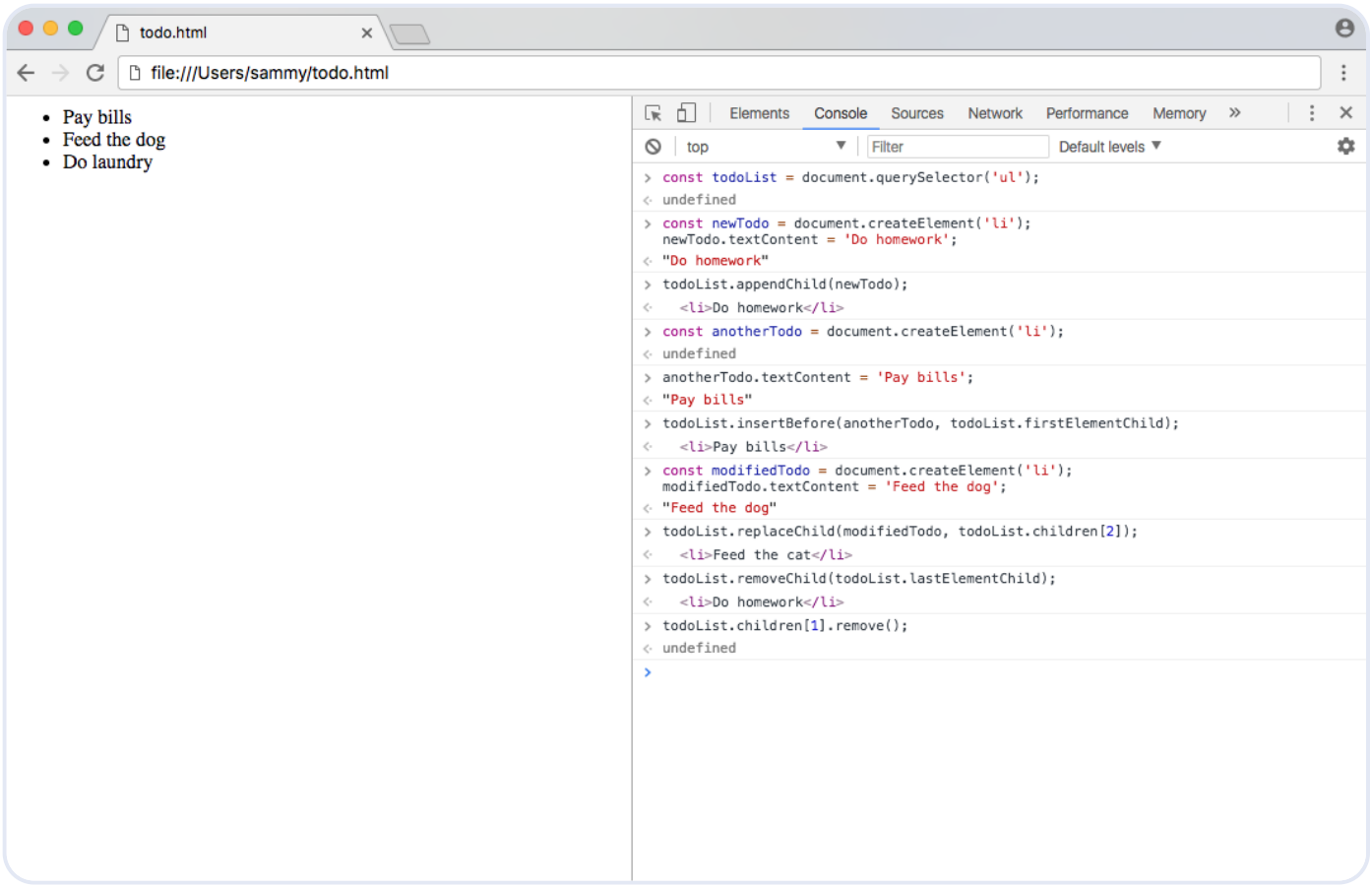
```
> // Remove second element child from todoList
> todoList.children[1].remove();
```

Copy

todo.html

```
<ul>
  <li>Pay bills</li>
  <li>Feed the dog</li>
  <li>Do laundry</li>
</ul>
```

Copy



Between `removeChild()` and `remove()`, you can remove any node from the DOM. Another method you may see for removing child elements from the DOM is setting the `innerHTML` property of a parent element to an empty string (`""`). This is not the preferred method because it is less explicit, but you might see it in existing code.

Conclusion

In this tutorial, we learned how to use JavaScript to create new nodes and elements and insert them into the DOM, and replace and remove existing nodes and elements.

At this point in the Understanding the DOM series you know how to access any element in the DOM, walk through any node in the DOM, and modify the DOM itself. You can now feel confident in creating basic front-end web apps with JavaScript.

Next in series: How To Modify Attributes, Classes, and Styles in the DOM →

Tutorial Series: Understanding the DOM – Document Object Model

The Document Object Model, usually referred to as the DOM, is an essential part of making websites interactive. It is an interface that allows a programming language to manipulate the content, structure, and style of a website. JavaScript is the client-side scripting language that connects to the DOM in an internet browser.

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Tania Rascia Author

Lisa Tagliaferri Editor

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LovableBlueShark • April 7, 2022

very good documentation. I am very glad for finding this documentation.

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rshanlon • August 25, 2019

Great tutorials! Your presentation and writing style is very clear!

I've been trying to learn more about innerHTML and thought XSS attacks were possible when using innerHTML connected to forms (i.e. user input). Otherwise, using innerHTML to just add HTML to the DOM isn't vulnerable to XSS. Is that how you understand it, too?

```
function showAnswer() {
    const answer = "<p>The answer is <strong>Ada Lovelace</strong>!</p>";
    document.querySelector('body').innerHTML = answer;
}
```

I also looked into **.insertAdjacentHTML()** as a "safer" way to add HTML via JS. An easy riff for appending is using the 'beforeend' 1st argument + the content to append.

```
function showAnswer() {
    const answer = "<p>The answer is <strong>Ada Lovelace</strong>!</p>";
    document.querySelector('body').insertAdjacentHTML('beforeend', answer
}
```

dutchtulip • October 17, 2018

These are really helpful. Thankyou!

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