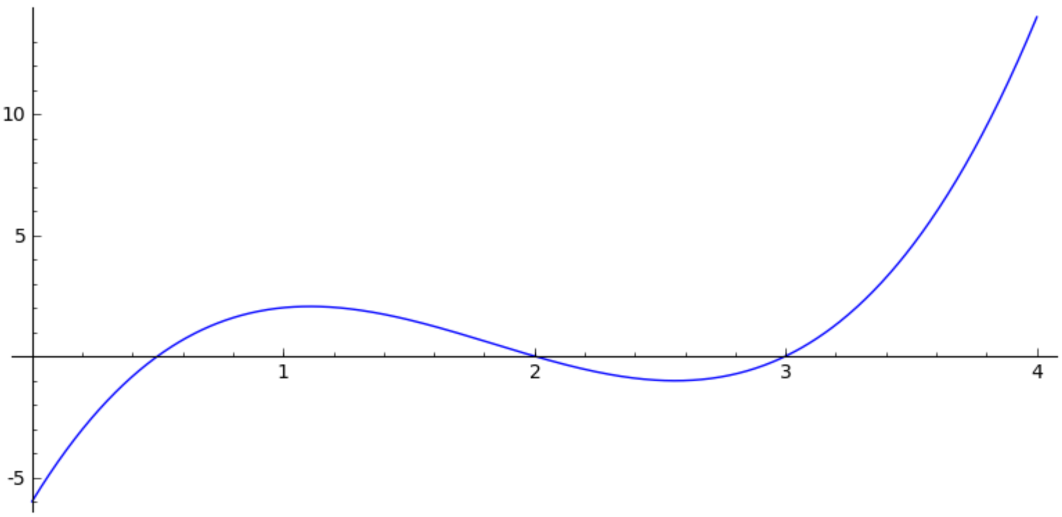
Name(s):



$y = 2t^3 - 11t^2 + 17t - 6$

1. Use the graph above to place the definite integrals in order (by their values) without evaluating the integrals:

a) $\displaystyle\int_0^{\frac{1}{2}} 2t^3 - 11t^2 + 17t - 6\ dt$

b) $\displaystyle\int_0^{1} 2t^3 - 11t^2 + 17t - 6\ dt$

c) $\displaystyle\int_0^{\frac{5}{2}} 2t^3 - 11t^2 + 17t - 6\ dt$

b) $\displaystyle\int_0^{4} 2t^3 - 11t^2 + 17t - 6\ dt$

2. Define a new function $\boxed{F(x) = \displaystyle\int_0^{x} 2t^3 - 11t^2 + 17t - 6\ dt}$

a) Try to identify the local extremes of $F(x)$ by interpreting $F(x)$ as a combination of areas under the graph in Figure 1. Recall that local extremes occur when F switches from increasing to decreasing or from decreasing to increasing. (It may help to go on to part b and then come back to this part).

b) Evaluate $F(1)$, $F(2)$, and $F(3)$.

c) Evaluate the integral to find an expression for $F(x)$ that doesn't involve integration.

c) Find the local extremes of $F(x)$ using the methods of chapter 3. Hint: the graph $y = 2t^3 - 11t^2 + 17t - 6$ crosses the x-axis at $t = \frac{1}{2}$, $t = 2$, and $t = 3$, hence $2t^3 - 11t^2 + 17t - 6$ has factors $2t - 1$, $t - 2$ and $t - 3$.

3. The Fresnel function S is defined as $S(x) = \int_0^x \sin\left(t^2\right) dt$. Do not try to evaluate this integral to find an expression for $S(x)$ (no one has found a good way to do this yet).

a) Let $F(t)$ be an antiderivative of $f(t) = \sin\left(t^2\right)$ (so $F'(t) = f(t)$). Use the evaluation theorem to express $S(x)$ in terms of F.

b) Differentiate your answer for part a to find $S'(x)$.

c) Find the location of a local maximum of S and a local minimum of S.