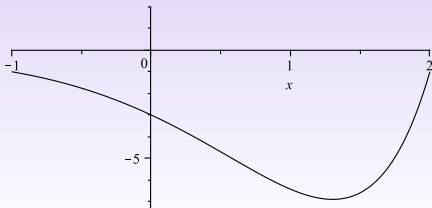


In Class Practice

1. Convert each expression into exponential form:

$$(a) \frac{2}{x^3} \quad (b) \sqrt[4]{6x^3} \quad (c) -\frac{5}{2\sqrt[3]{x}}$$

2. Find a function of the form $f(x) = ae^{bx}$ which goes through the points $(0, 2)$ and $(2, 6)$.
3. Find the compositions $f \circ g(x)$ and $g \circ f(x)$ if $f(x) = x^2 + x$ and $g(x) = \sin(x)$.
4. Identify functions $f(x)$ and $g(x)$ such that $\sqrt{(x-2)^4 + 3}$ is $f \circ g(x)$.
5. Use the graph below to sketch the graph of $3f(x) + 5$



Solutions

1. Convert each expression into exponential form:

(a) $d \frac{2}{x^3} = 2x^{-3}$

(b) $\sqrt[4]{6x^3} = 6^{1/4}x^{3/4}$

(c) $-\frac{5}{2\sqrt[3]{x}} = -\frac{5}{2}x^{-1/3}$

Solutions

2. Find a function of the form $f(x) = ae^{bx}$ which goes through the points $(0, 2)$ and $(2, 6)$.

$$(0, 2) \text{ on the graph} \implies f(0) = 2.$$

$$\text{i.e. } 2 = f(0) = ae^{b \cdot 0} = ae^0 = a.$$

Thus we know that $f(x) = 2e^{bx}$. We still need to find b .

$$(2, 6) \text{ on the graph} \implies f(2) = 6.$$

$$\text{i.e. } 6 = f(2) = 2e^{2b}.$$

We need to solve for b .

$$6 = 2e^{2b} \implies 3 = e^{2b}$$

$$\ln(3) = 2b \text{ (because } \ln(x) \text{ and } e^x \text{ are inverses)}$$

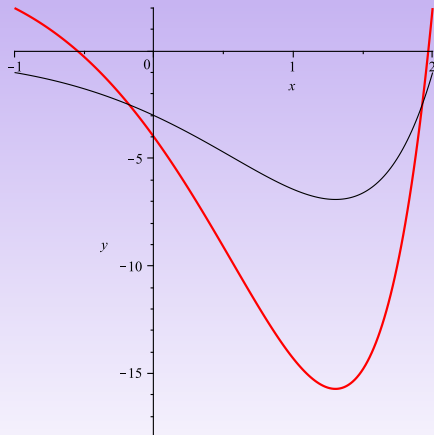
$$\frac{\ln(3)}{2} = b \implies f(x) = 2e^{\frac{x}{2} \ln(3)}$$

Solutions:

3. Find the compositions $f \circ g(x)$ and $g \circ f(x)$ if $f(x) = x^2 + x$ and $g(x) = \sin(x)$.
- (a) $f \circ g(x) = f(g(x)) = f(\sin(x)) = \sin^2(x) + \sin(x)$
- (b) $g \circ f(x) = g(f(x)) = g(x^2 + x) = \sin(x^2 + x)$
4. Identify functions $f(x)$ and $g(x)$ such that $\sqrt{(x-2)^4 + 3}$ is $f \circ g(x)$.
- ▶ One possibility: $g(x) = x - 2$, $f(x) = \sqrt{x^4 + 3}$
 - ▶ Another possibility: $g(x) = (x - 2)^4$, $f(x) = \sqrt{x + 3}$
 - ▶ Yet another possibility: $g(x) = (x - 2)^4 + 3$, $f(x) = \sqrt{x}$.

Solutions:

5. Use the graph below to sketch the graph of $3f(x) + 5$



Goal:

To estimate the rate the function $f(x) = e^x$ changes at the point $x = 1$.

Find the following average rates of change. Make a table keeping track of your results.

Find the average rate of change of e^x

1. from $x = 1$ to $x = 2$
2. from $x = 1$ to $x = 1.1$
3. from $x = 1$ to $x = 1.01$

4. from $x = 0$ to $x = 1$
5. from $x = 0.9$ to $x = 1$
6. from $x = 0.99$ to $x = 1$

Find the following average rates of change for $f(x) = e^x$. Make a table keeping track of your results.

$x = 1$ to $x = ?$	Average rate of change	$x = ?$ to $x = 1$	Average rate of change
2	$\frac{e^2 - e^1}{2 - 1} \approx 4.6708$	0	$\frac{e^1 - e^0}{1 - 0} \approx 1.7183$
1.1	$\frac{e^{1.1} - e^1}{1.1 - 1} \approx 2.8588$	0.9	$\frac{e^1 - e^{0.9}}{1 - 0.9} \approx 2.5868$
1.01	$\frac{e^{1.01} - e^1}{1.01 - 1} \approx 2.7319$	0.99	$\frac{e^1 - e^{0.99}}{1 - 0.99} \approx 2.7047$
1.001	$\frac{e^{1.001} - e^1}{1.001 - 1} \approx 2.7196$	0.999	$\frac{e^1 - e^{0.999}}{1 - 0.999} \approx 2.7169$
1.0001	$\frac{e^{1.0001} - e^1}{1.0001 - 1} \approx 2.7184$	0.9999	$\frac{e^1 - e^{0.9999}}{1 - 0.9999} \approx 2.7181$