

Limits from the Derivative Definition

Find each exact limit.

1. $\lim_{h \rightarrow 0} \frac{((3/2+h)^5 - (3/2)^5)}{h}$

2. $\lim_{h \rightarrow 0} \frac{((-2)/((4/3+h)^3) - (-2)/((4/3)^3))}{h}$

3. $\lim_{h \rightarrow 0} \frac{(-4\sin(1(3/4\pi+h)+0)) - (-4\sin(1(3/4\pi)+0))}{h}$

4. $\lim_{h \rightarrow 0} \frac{(2\cos(1(1/3\pi+h)+0)) - (2\cos(1(1/3\pi)+0))}{h}$

5. $\lim_{h \rightarrow 0} \frac{(3\tan(1(2/3\pi+h)+0)) - (3\tan(1(2/3\pi)+0))}{h}$

6. $\lim_{h \rightarrow 0} \frac{(2(3/2+h)^5+1) - (2(3/2)^5+1)}{h}$

Limits from the Derivative Definition

Find each exact limit.

7. $\lim_{h \rightarrow 0} \left[\frac{(-3)/((4/3+h)^3)}{(-3)/((4/3)^3)} - 1 \right] / h$

8. $\lim_{h \rightarrow 0} \left[\frac{4\sin(1/3\pi+h) + 0}{4\sin(1/3\pi) + 0} - 1 \right] / h$

Limits from the Derivative Definition

Answer Key

Find each exact limit.

1. $\lim_{h \rightarrow 0} \frac{((3/2+h)^5 - (3/2)^5)}{h}$

The quotient is $f'(3/2)$ for $f(x)=x^5$.

The derivative gives $f'(3/2)=405/16$.

Answer: $405/16$

2. $\lim_{h \rightarrow 0} \frac{((-2)/((4/3+h)^3) - (-2)/((4/3)^3))}{h}$

The quotient is $f'(4/3)$ for $f(x)=(-2)/(x^3)$.

The derivative gives $f'(4/3)=243/128$.

Answer: $243/128$

3. $\lim_{h \rightarrow 0} \frac{(-4\sin(1(3/4\pi+h)+0)) - (-4\sin(1(3/4\pi)+0))}{h}$

The quotient is $f'(3/4\pi)$ for $f(x)=-4\sin(1x+0)$.

The derivative gives $f'(3/4\pi)=2\sqrt{2}$.

Answer: $2\sqrt{2}$

4. $\lim_{h \rightarrow 0} \frac{(2\cos(1(1/3\pi+h)+0)) - (2\cos(1(1/3\pi)+0))}{h}$

The quotient is $f'(1/3\pi)$ for $f(x)=2\cos(1x+0)$.

The derivative gives $f'(1/3\pi)=-\sqrt{3}$.

Answer: $-\sqrt{3}$

Limits from the Derivative Definition

Answer Key

Find each exact limit.

5. $\lim_{h \rightarrow 0} [(3\tan(1/3\pi+h)+0)-(3\tan(1/3\pi+0))]/h$

The quotient is $f'(2/3\pi)$ for $f(x)=3\tan(1x+0)$.

The derivative gives $f'(2/3\pi)=12$.

Answer: 12

6. $\lim_{h \rightarrow 0} [(2(3/2+h)^5+1)-(2(3/2)^5+1)]/h$

The quotient is $f'(3/2)$ for $f(x)=2x^5+1$.

The derivative gives $f'(3/2)=405/8$.

Answer: 405/8

7. $\lim_{h \rightarrow 0} [((-3)/((4/3+h)^3))-((-3)/((4/3)^3))]/h$

The quotient is $f'(4/3)$ for $f(x)=(-3)/(x^3)$.

The derivative gives $f'(4/3)=729/256$.

Answer: 729/256

8. $\lim_{h \rightarrow 0} [(4\sin(1/4\pi+h)+0)-(4\sin(1/4\pi+0))]/h$

The quotient is $f'(3/4\pi)$ for $f(x)=4\sin(1x+0)$.

The derivative gives $f'(3/4\pi)=-2\sqrt{2}$.

Answer: $-2\sqrt{2}$