Calculus Practice 2.1A3: Derivatives 1b

Evaluate each limit.

1) $\lim_{h \to 0} \frac{\left(-\frac{1}{3} + h\right)^2 - \left(-\frac{1}{3}\right)^2}{h}$

2) $\lim_{h \to 0} \frac{\left(-\frac{1}{2} + h\right)^3 - \left(-\frac{1}{2}\right)^3}{h}$

3) $\lim_{h \to 0} \frac{\left(\frac{4}{3} + h\right)^2 - \frac{16}{9}}{h}$

4) $\lim_{h \to 0} \frac{\left(\frac{3}{2} + h\right)^3 - \frac{27}{8}}{h}$

5) $\lim_{h \to 0} \frac{\left(-\frac{2}{3} + h\right)^5 - \left(-\frac{2}{3}\right)^5}{h}$

6) $\lim_{h \to 0} \frac{\left(-\frac{1}{2} + h\right)^5 - \left(-\frac{1}{2}\right)^5}{h}$

7) $\lim_{h \to 0} \frac{\left(-\frac{1}{3} + h\right)^5 + \frac{1}{243}}{h}$

8) $\lim_{h \to 0} \frac{\left(\frac{1}{3} + h\right)^5 - \frac{1}{243}}{h}$

9) $\lim_{h \to 0} \frac{\sqrt{4+h} - \sqrt{4}}{h}$

10) $\lim_{h \to 0} \frac{\sqrt{5+h} - \sqrt{5}}{h}$

11) $\lim_{h \to 0} \frac{\sqrt[3]{2+h} - \sqrt[3]{2}}{h}$

12) $\lim_{h \to 0} \frac{\sqrt{4+h} - 2}{h}$

13) $\lim_{h \to 0} \frac{\sin\left(\frac{\pi}{3} + h\right) - \sin\frac{\pi}{3}}{h}$

14) $\lim_{h \to 0} \frac{\sin\left(\frac{5\pi}{6} + h\right) - \sin\frac{5\pi}{6}}{h}$

15) $\lim_{h \to 0} \frac{\sin\left(\frac{3\pi}{4} + h\right) - \frac{\sqrt{2}}{2}}{h}$

16) $\lim_{h \to 0} \frac{\cos\left(\frac{\pi}{6} + h\right) - \frac{\sqrt{3}}{2}}{h}$

17) $\lim_{h \to 0} \frac{\ln\left(3+h\right) - \ln 3}{h}$

18) $\lim_{h \to 0} \frac{\ln\left(10+h\right) - \ln 10}{h}$

Calculus Practice 2.1A3: Derivatives 1b

Evaluate each limit.

1) $\lim_{h \to 0} \frac{\left(-\frac{1}{3} + h\right)^2 - \left(-\frac{1}{3}\right)^2}{h}$

$-\frac{2}{3}$

2) $\lim_{h \to 0} \frac{\left(-\frac{1}{2} + h\right)^3 - \left(-\frac{1}{2}\right)^3}{h}$

$\frac{3}{4}$

3) $\lim_{h \to 0} \frac{\left(\frac{4}{3} + h\right)^2 - \frac{16}{9}}{h}$

$\frac{8}{3}$

4) $\lim_{h \to 0} \frac{\left(\frac{3}{2} + h\right)^3 - \frac{27}{8}}{h}$

$\frac{27}{4}$

5) $\lim_{h \to 0} \frac{\left(-\frac{2}{3} + h\right)^5 - \left(-\frac{2}{3}\right)^5}{h}$

$\frac{80}{81}$

6) $\lim_{h \to 0} \frac{\left(-\frac{1}{2} + h\right)^5 - \left(-\frac{1}{2}\right)^5}{h}$

$\frac{5}{16}$

7) $\lim_{h \to 0} \frac{\left(-\frac{1}{3} + h\right)^5 + \frac{1}{243}}{h}$

$\frac{5}{81}$

8) $\lim_{h \to 0} \frac{\left(\frac{1}{3} + h\right)^5 - \frac{1}{243}}{h}$

$\frac{5}{81}$

9) $\lim_{h \to 0} \frac{\sqrt{4+h} - \sqrt{4}}{h}$

$\frac{1}{4}$

10) $\lim_{h \to 0} \frac{\sqrt{5+h} - \sqrt{5}}{h}$

$\frac{\sqrt{5}}{10}$

11) $\lim_{h \to 0} \frac{\sqrt[3]{2+h} - \sqrt[3]{2}}{h}$

$\frac{\sqrt[3]{2}}{6}$

12) $\lim_{h \to 0} \frac{\sqrt{4+h} - 2}{h}$

$\frac{1}{4}$

13) $\lim_{h \to 0} \frac{\sin\left(\frac{\pi}{3} + h\right) - \sin\frac{\pi}{3}}{h}$

$\frac{1}{2}$

14) $\lim_{h \to 0} \frac{\sin\left(\frac{5\pi}{6} + h\right) - \sin\frac{5\pi}{6}}{h}$

$-\frac{\sqrt{3}}{2}$

15) $\lim_{h \to 0} \frac{\sin\left(\frac{3\pi}{4} + h\right) - \frac{\sqrt{2}}{2}}{h}$

$-\frac{\sqrt{2}}{2}$

16) $\lim_{h \to 0} \frac{\cos\left(\frac{\pi}{6} + h\right) - \frac{\sqrt{3}}{2}}{h}$

$-\frac{1}{2}$

17) $\lim_{h \to 0} \frac{\ln(3+h) - \ln 3}{h}$

$\frac{1}{3}$

18) $\lim_{h \to 0} \frac{\ln(10+h) - \ln 10}{h}$

$\frac{1}{10}$