

**Calculus Practice: Derivatives 1b****Evaluate each limit.**

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

## Calculus Practice: Derivatives 1b

Evaluate each limit.

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

$$2) \lim_{h \rightarrow 0} \frac{\left(-\frac{1}{2} + h\right)^3 - \left(-\frac{1}{2}\right)^3}{h}$$
$$\frac{3}{4}$$

$$3) \lim_{h \rightarrow 0} \frac{\left(\frac{4}{3} + h\right)^2 - \frac{16}{9}}{h}$$
$$\frac{8}{3}$$

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

$$5) \lim_{h \rightarrow 0} \frac{\left(-\frac{2}{3} + h\right)^5 - \left(-\frac{2}{3}\right)^5}{h}$$
$$\frac{80}{81}$$

$$6) \lim_{h \rightarrow 0} \frac{\left(-\frac{1}{2} + h\right)^5 - \left(-\frac{1}{2}\right)^5}{h}$$
$$\frac{5}{16}$$

$$7) \lim_{h \rightarrow 0} \frac{\left(-\frac{1}{3} + h\right)^5 + \frac{1}{243}}{h}$$
$$\frac{5}{81}$$

$$8) \lim_{h \rightarrow 0} \frac{\left(\frac{1}{3} + h\right)^5 - \frac{1}{243}}{h}$$
$$\frac{5}{81}$$

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

$$\frac{1}{4}$$

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

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

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

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

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

$$\frac{1}{4}$$

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

$$\frac{1}{2}$$

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

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

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

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

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

$$-\frac{1}{2}$$

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

$$\frac{1}{3}$$

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

$$\frac{1}{10}$$