# INTRODUCTION TO DIFFERENTIATION - CHAPTER REVIEW

**1** Find the following limits. **(a)** $\lim\limits_{x\to\frac{1}{2}} \dfrac{1-4x^2}{1-2x}$ **(b)** $\lim\limits_{x\to 3} \dfrac{x^3-27}{x-3}$

**2** Evaluate: **(a)** $\lim\limits_{h\to 0} \dfrac{2x^2h+3h}{h}$ **(b)** $\lim\limits_{h\to 0} \dfrac{(2+h)^2-4}{h}$ **(c)** $\lim\limits_{h\to 0} \dfrac{(1+h)^3-1}{h}$

**3** Find $\frac{f(x+h)-f(x)}{h}$, $h \neq 0$, for $f(x) = 2x^2 - 3x$.

**4** For $f(x) = x^2 + 6x + 8$, find:

**(a)** $f(2)$ **(b)** $f'(2)$ **(c)** $f'(c)$ **(d)** the value of $c$ for which $f'(c) = -2$

**5** Find $f'(x)$ for $f(x)=\sqrt{2x-1}$.

**6** Given $y=(x^2-4)(3x^2-2x+1)^5$, find $\frac{dy}{dx}$.

**7** Find the derivative of each function.

**(a)** $y=(x-2)^3$ **(b)** $f(x)=(x^2+x^3)^5$ **(c)** $v=\sqrt{25-t^2}$

**(d)** $y=(x+x^{-1})^2$ **(e)** $g(x)=\dfrac{1}{(x+4)^2}$ **(f)** $y=\dfrac{x-2}{x}$

**7** Find the derivative of each function.

(j) $u = \dfrac{2m-7}{2m+3}$

(k) $y = \dfrac{1+x^3}{x^2}$

(l) $h(t) = (t-3)\sqrt{t-3}$

**9** Find the equation of the tangent to the parabola $y = 4x - x^2$ at the point where the gradient is $-2$.

**10** Find the equation of the tangents to the curve $y = 2x^2(4 - x)$ at the point where the curve intersects the $x$-axis.

**12** A particle is moving along the $x$-axis and is initially at the origin. Its velocity $v$ metres per second at time $t$ seconds is given by $v = \dfrac{2t}{9+t^2}$.

**(a)** What is the initial velocity of the particle?

**(b)** Find an expression for the acceleration of the particle.

**(c)** When is the acceleration zero?

**(d)** What is the maximum velocity attained by the particle and when does it occur?

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**1** Differentiate:

**(a)** $e^{x^2}+2$ **(b)** $\left(e^x+x^2\right)^4$ **(c)** $e^x+ex$

**5** In statistics, the normal probability density function is given by $f(x)=\frac{1}{\sqrt{2\pi}}e^{-\frac{x^2}{2}}$. Find $f'(0)$.

**2** Differentiate **(a)** $(x^2+2x)e^x$ **(c)** $2^x+3^x+4^x$ **(e)** $(x^2+3x)e^{-3x}$