

Section 2: Inverse trigonometric functions

Section test

1. $\frac{d}{dx}(\arccos 3x) =$

(a) $\frac{-3}{\sqrt{1-9x^2}}$

(b) $\frac{3}{\sqrt{1-9x^2}}$

(c) $\frac{-1}{\sqrt{1-3x^2}}$

(d) $\frac{1}{\sqrt{1-3x^2}}$

2. $\frac{d}{dx}(\arctan(2x-1)) =$

(a) $\frac{2}{1+4x^2}$

(b) $\frac{1}{1-2x+2x^2}$

(c) $\frac{2}{1-2x+2x^2}$

(d) $\frac{1}{1+4x^2}$

3. $\frac{d}{dx}(\arcsin(x^2)) =$

(a) $\frac{1}{\sqrt{1-x^2}}$

(b) $\frac{2x}{\sqrt{1-x^2}}$

(c) $\frac{1}{\sqrt{1-x^4}}$

(d) $\frac{2x}{\sqrt{1-x^4}}$

4. $\frac{d}{dx}\left(\arccos \frac{1}{\sqrt{x}}\right) =$

(a) $\frac{1}{2x\sqrt{1-x}}$

(b) $\frac{-1}{2x\sqrt{x-1}}$

(c) $\frac{1}{2x\sqrt{x-1}}$

(d) $\frac{-1}{2x\sqrt{1-x}}$

5. $\frac{d}{dx}(\arcsin(e^x)) =$

(a) $\frac{1}{\sqrt{1-e^{2x}}}$

(b) $\frac{e^x}{\sqrt{1-e^x}}$

(c) $\frac{e^x}{\sqrt{1-e^{2x}}}$

(d) $\frac{1}{\sqrt{1-e^x}}$

Edexcel FM Further calculus 2 section test solutions

6. $\frac{d}{dx}(\arctan(\sin x)) =$

(a) $\frac{-\cos x}{1 + \sin^2 x}$

(b) $\frac{\cos x}{1 + \sin^2 x}$

(c) $\frac{1}{1 + \sin^2 x}$

(d) $\frac{-1}{1 + \sin^2 x}$

7. Find $\int \frac{2}{9+x^2} dx$

(a) $\frac{2}{3} \arctan \frac{x}{3} + c$

(b) $\frac{2}{9} \arctan \frac{x}{9} + c$

(c) $2 \arctan \frac{x}{3} + c$

(d) $2 \arctan \frac{x}{9} + c$

8. Find $\int \frac{3}{\sqrt{4-x^2}} dx$

(a) $3 \arcsin \frac{x}{4} + c$

(b) $\frac{3}{2} \arcsin \frac{x}{2} + c$

(c) $3 \arcsin \frac{x}{2} + c$

(d) $\frac{3}{4} \arcsin \frac{x}{4} + c$

9. Find $\int \frac{1}{9+4x^2} dx$

(a) $\frac{1}{4} \arctan \frac{2x}{3} + c$

(b) $\frac{2}{3} \arctan \frac{2x}{3} + c$

(c) $\frac{1}{6} \arctan \frac{2x}{3} + c$

(d) $\frac{1}{3} \arctan \frac{x}{3} + c$

10. Find $\int_0^{1/2} \frac{1}{\sqrt{1-3x^2}} dx$

(a) $\pi\sqrt{3}$

(b) $\frac{\pi}{3}$

(c) $\frac{\pi}{\sqrt{3}}$

(d) $\frac{\pi}{3\sqrt{3}}$

Edexcel FM Further calculus 2 section test solutions

Solutions to section test

$$\begin{aligned} 1. \frac{d}{dx}(\arccos 3x) &= -\frac{1}{\sqrt{1-(3x)^2}} \times 3 \\ &= -\frac{3}{\sqrt{1-9x^2}} \end{aligned}$$

$$\begin{aligned} 2. \frac{d}{dx}(\arctan(2x-1)) &= \frac{1}{1+(2x-1)^2} \times 2 \\ &= \frac{2}{1+4x^2-4x+1} \\ &= \frac{2}{4x^2-4x+2} \\ &= \frac{1}{2x^2-2x+1} \end{aligned}$$

$$\begin{aligned} 3. \frac{d}{dx}(\arcsin(x^2)) &= \frac{1}{\sqrt{1-(x^2)^2}} \times 2x \\ &= \frac{2x}{\sqrt{1-x^4}} \end{aligned}$$

The derivative of x^2 is $2x$

$$\begin{aligned} 4. \frac{d}{dx}\left(\arccos \frac{1}{\sqrt{x}}\right) &= -\frac{1}{\sqrt{1-\left(\frac{1}{\sqrt{x}}\right)^2}} \times -\frac{1}{2}x^{-\frac{3}{2}} \\ &= \frac{1}{2x\sqrt{x}\sqrt{1-\frac{1}{x}}} \\ &= \frac{1}{2x\sqrt{x-1}} \end{aligned}$$

The derivative of $x^{-\frac{1}{2}}$ is $-\frac{1}{2}x^{-\frac{3}{2}}$

$$\begin{aligned} 5. \frac{d}{dx}(\arcsin(e^x)) &= \frac{1}{\sqrt{1-(e^x)^2}} \times e^x \\ &= \frac{e^x}{\sqrt{1-e^{2x}}} \end{aligned}$$

The derivative of e^x is e^x

$$\begin{aligned} 6. \frac{d}{dx}(\arctan(\sin x)) &= \frac{1}{1+(\sin x)^2} \times \cos x \\ &= \frac{\cos x}{1+\sin^2 x} \end{aligned}$$

Edexcel FM Further calculus 2 section test solutions

$$\begin{aligned} 7. \int \frac{2}{9+x^2} dx &= 2 \int \frac{1}{3^2+x^2} dx \\ &= \frac{2}{3} \arctan \frac{x}{3} + c \end{aligned}$$

$$\begin{aligned} 8. \int \frac{3}{\sqrt{4-x^2}} dx &= 3 \int \frac{1}{\sqrt{2^2-x^2}} dx \\ &= 3 \arcsin \frac{x}{2} + c \end{aligned}$$

$$\begin{aligned} 9. \int \frac{1}{9+4x^2} dx &= \frac{1}{4} \int \frac{1}{\frac{9}{4}+x^2} dx \\ &= \frac{1}{4} \int \frac{1}{\left(\frac{3}{2}\right)^2+x^2} dx \\ &= \frac{1}{4} \times \frac{2}{3} \arctan \frac{2x}{3} + c \\ &= \frac{1}{6} \arctan \frac{2x}{3} + c \end{aligned}$$

$$\begin{aligned} 10. \int_0^{1/2} \frac{1}{\sqrt{1-3x^2}} dx &= \frac{1}{\sqrt{3}} \int_0^{1/2} \frac{1}{\sqrt{\frac{1}{3}-x^2}} dx \\ &= \frac{1}{\sqrt{3}} \left[\arcsin(x\sqrt{3}) \right]_0^{1/2} \\ &= \frac{1}{\sqrt{3}} \left(\arcsin \frac{\sqrt{3}}{2} - \arcsin 0 \right) \\ &= \frac{1}{\sqrt{3}} \left(\frac{\pi}{3} - 0 \right) = \frac{\pi}{3\sqrt{3}} \end{aligned}$$