## Tangent to a curve and derivative of a function Solutions Main Menu

**108** Which of the following is the correct expression for differentiating $f(x)=x^2-4x$ from first principles?

(A) $f'(x)=\lim_{h\to 0}\frac{(x-h)^2-4(x-h)-(x^2-4x)}{h}$

(B) $f'(x)=\lim_{h\to 0}\frac{(x-h)^2-4(x-h)-(x^2-4x)}{h}$

(C) $f'(x)=\lim_{h\to 0}\frac{(x+h)^2-4(x+h)+(x^2-4x)}{h}$

(D) $f'(x)=\lim_{h\to 0}\frac{(x+h)^2-4(x+h)-(x^2-4x)}{h}$

**109** Which of the following is the correct expression for differentiating $f(x)=\frac{1}{x}$ from first principles?

(A) $f'(x)=\lim_{h\to 0}\frac{\frac{1}{x+h}-\frac{1}{x}}{h}$

(B) $f'(x)=\lim_{h\to 0}\frac{x+h-x}{h}$

(C) $f'(x)=\lim_{h\to 0}\frac{\frac{1}{x}-\frac{1}{x+h}}{h}$

(D) $f'(x)=\lim_{h\to 0}\frac{h}{x+h-x}$

**110** What is the derivative of $3x^5-4x^2+2$?

(A) $15x^4-8x+2$

(B) $15x^5-8x^2+2$

(C) $15x^4-8x$

(D) $15x^5-8x^2$

**111** What is the derivative of $5-3x+9x^4$?

(A) $36x^4-3$

(B) $36x^4+2$

(C) $36x^3-3$

(D) $36x^3+2$





**112** What is the value of $\frac{dy}{dx}$ if $y=2\sqrt{x}$?

(A) $\frac{dy}{dx}=\frac{1}{\sqrt{x}}$

(B) $\frac{dy}{dx}=\frac{2}{\sqrt{x}}$

(C) $\frac{dy}{dx}=\frac{\sqrt{x}}{2}$

(D) $\frac{dy}{dx}=2$

**113** What is the value of $f'(3)$ if $f(x)=3x-x^3$?

(A) $f'(3)=-24$

(B) $f'(3)=-18$

(C) $f'(3)=0$

(D) $f'(3)=9$

**114** What is the value of $\frac{dy}{dx}$ if $y=(2x-3)^8$?

(A) $\frac{dy}{dx}=8(2x-3)^7$

(B) $\frac{dy}{dx}=8(2x-3)^8$

(C) $\frac{dy}{dx}=16(2x-3)^7$

(D) $\frac{dy}{dx}=16(2x-3)^8$

**115** What is the value of $f'(x)$ if $f(x)=\sqrt{3-x}$?

(A) $f'(x)=\frac{-1}{2\sqrt{3-x}}$

(B) $f'(x)=\frac{-2}{\sqrt{3-x}}$

(C) $f'(x)=\frac{2}{\sqrt{3-x}}$

(D) $f'(x)=\frac{1}{2\sqrt{3-x}}$

**116** What is the derivative of $(5x+4)^3(x+1)^4$?

(A) $(5x+4)^2(x+1)^3(6x+5)$

(B) $(5x+4)^2(x+1)^3(10x+9)$

(C) $(5x+4)^2(x+1)^3(23x+19)$

(D) $(5x+4)^2(x+1)^3(35x+31)$

**117** What is the value of $f'(x)$ if $f(x)=3x^4(4-x)^3$?

(A) $f'(x)=3x^3(4-x)^3(7x-16)$

(B) $f'(x)=3x^3(4-x)^3(-7x+16)$

(C) $f'(x)=3x^3(4-x)^2(7x-16)$

(D) $f'(x)=3x^3(4-x)^2(-7x+16)$

**118** What is the value of $f'(x)$ if $f(x)=\dfrac{2x-3}{3x-2}$?

(A) $f'(x)=\dfrac{-5}{(3x-2)}$

(B) $f'(x)=\dfrac{5}{(3x-2)}$

(C) $f'(x)=\dfrac{-5}{(3x-2)^2}$

(D) $f'(x)=\dfrac{5}{(3x-2)^2}$

**119** What is the gradient of the curve $y=x^2-x-6$ at $(6,24)$?

(A) 11

(B) 12

(C) 23

(D) 24

**120** What is the equation of the tangent to the curve $y=x^2-2x$ at the point $(1,-1)$?

(A) $y=-1$

(B) $y=1$

(C) $y=x+2$

(D) $y=x-2$





**121** What is the equation of the normal to the curve $f(x)=x^2-4x$ at $(1,-3)$?

(A) $x+2y-7=0$

(B) $x-2y-7=0$

(C) $2x-y-5=0$

(D) $2x+y+5=0$

| Tangent to a curve and derivative of a function | | Main Menu |
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| | **Solution** | **Criteria** |
| 108 | $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$<br>$=\lim_{h\to 0}\frac{(x+h)^2-4(x+h)-(x^2-4x)}{h}$ | 1 Mark: D |
| 109 | $f'(x)=\lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$<br>$=\lim_{h\to 0}\frac{\frac{1}{x+h}-\frac{1}{x}}{h}$ | 1 Mark: A |
| 110 | $\frac{d}{dx}(3x^5-4x^2+2)=15x^4-8x$ | 1 Mark: C |
| 111 | $\frac{d}{dx}\left(5-3x+9x^4\right)=-3+36x^3=36x^3-3$ | 1 Mark: C |
| 112 | $\frac{dy}{dx}=2\times\frac{1}{2}x^{-\frac{1}{2}}=\frac{1}{\sqrt{x}}$ | 1 Mark: A |
| 113 | $f'(x)=3-3x^2$<br>$f'(3)=3-3\times 3^2$<br>$=-24$ | 1 Mark: A |
| 114 | $\frac{dy}{dx}=8(2x-3)^7\times 2$<br>$=16(2x-3)^7$ | 1 Mark: C |
| 115 | $f(x)=(3-x)^{\frac{1}{2}}$<br>$=\frac{1}{2}(3-x)^{-\frac{1}{2}}\times -1$<br>$=\frac{-1}{2\sqrt{3-x}}$ | 1 Mark: A |
| 116 | $\frac{d}{dx}(5x+4)^3(x+1)^4=(5x+4)^3\times 4(x+1)^3+(x+1)^4 3(5x+4)^2\times 5$<br>$=(5x+4)^2(x+1)^3[(5x+4)4+(x+1)15]$<br>$=(5x+4)^2(x+1)^3(35x+31)$ | 1 Mark: D |
| 117 | $f'(x)=3x^4\times 3(4-x)^2\times -1+(4-x)^3\times 12x^3$<br>$=3x^3(4-x)^2[-3x+(4-x)\times 4]$<br>$=3x^3(4-x)^2(-7x+16)$ | 1 Mark: D |





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| 118 | $f'(x)=\frac{(3x-2)2-(2x-3)3}{(3x-2)^2}$<br>$=\frac{6x-4-6x+9}{(3x-2)^2}=\frac{5}{(3x-2)^2}$ | 1 Mark: D |
| 119 | $y=x^2-x-6$<br>$\frac{dy}{dx}=2x-1$<br>At $(6,24)$ $\frac{dy}{dx}=2\times 6-1=11$<br>Gradient of the curve is 11 | 1 Mark: A |
| 120 | $y=x^2-2x$ At the point $(1,-1)$ $\frac{dy}{dx}=2\times 1-2=0$<br>$\frac{dy}{dx}=2x-2$<br>Point slope formula $y-y_1=m(x-x_1)$<br>$y-(-1)=0(x-1)$<br>$y=-1$ | 1 Mark: A |
| 121 | $f'(x)=2x-4$<br>At $(1,-3)$ $f'(x)=2\times 1-4=-2$<br>Normal is perpendicular to the gradient of the tangent<br>$m_1m_2=-1,\quad m_1\times -2=-1,\quad m_1=\frac{1}{2}$<br>Equation of the normal at $(1,-3)$<br>$y-y_1=m(x-x_1)$<br>$y-(-3)=\frac{1}{2}(x-1)$<br>$2y+6=x-1$<br>$x-2y-7=0$ | 1 Mark: B |