

Mathematics for Political Science

Lesson 3: Calculus

Solutions

1. (a) -4
(b) -5
(c) 1.6
(d) 2
2. (a) 9
(b) 3
(c) 1
3. (a) $x^{-\frac{2}{3}}$
(b) 14
(c) $3y^2 + 6y$
(d) $5x^4 + 3x^2 - 2x$
(e) $1 + 3y^2 + \frac{14}{y^3}$
(f) $2y + y^{-2} - 3y^{-4}$
(g) $\frac{12x^2 - 8x + 16}{x^4 - 8x^3 + 16x^2}$
(h) $e^{y^2 - 3y + 2}(2y - 3)$
(i) $\frac{2}{x}$
4. $4(8(x^4 + 2) - 1) * 8 * 4x^3$
5.

$f(x) = 3x^2 - 7x + 2$
 - $f(x)$: minimum at $x = \frac{7}{6}$
 - $g(x)$: maximum at $x = \frac{23 - \sqrt{91}}{12}$, minimum at $x = \frac{23 + \sqrt{91}}{12}$

$g(x) = 8x^3 - 46x^2 + 73x - 35$
6. (a) $0 = \frac{2}{x} + 1 - \frac{2}{2x+1}$
(b) $-2x^2 + x + 2 = 0$
(c) Zeroes at approximately -0.78 and 1.28 .
7. • $\frac{\partial(\cdot)}{\partial e} = h(eR(\frac{f}{f+g}))^{h-1} R \frac{f}{f+g}$
• $\frac{\partial(\cdot)}{\partial f} = h(eR(\frac{f}{f+g}))^{h-1} eR \frac{g}{(f+g)^2}$
8. (a) $y^4 + C$
(b) $\frac{1}{3}x^3 - 2x^{\frac{1}{2}} + C$
(c) $\frac{360}{7}t^7 + C$
9. (a) a. 700
(b) $\frac{531440}{3}$
(c) 0
(d) $28\frac{2}{3}$
(e) $e^4 - e^2$
(f) $\frac{16}{3} - \frac{4}{3}\sqrt{2}$
10. $2306\frac{2}{3}$