Mathematics for Political Science

Lesson 3: Calculus

Solutions

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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. $$f(x) = 3x^2 - 7x + 2 \qquad g(x) = 8x^3 - 46x^2 + 73x - 35$$
   - f(x): minimum at $x = \frac{7}{6}$
   - g(x): maximum at $x = \frac{23-\sqrt{91}}{12}$, minimum at $x = \frac{23+\sqrt{91}}{12}$
6. (a) $0 = \frac{2}{x} - 1 - \frac{2}{2x+1}$
   (b) $-2x^2 + x + 2 = 0$
   (c) Zeroes at approximately -.78 and 1.28.
7. - $\frac{\partial(.)}{\partial e} = h(eR(\frac{f}{f+g}))^{h-1} R \frac{f}{f+g}$
   - $\frac{\partial(.)}{\partial f} = h(eR(\frac{f}{f+g}))^{h-1} eR \frac{g}{(f+g)^2}$
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. $2306\frac{2}{3}$