

Sm223 2010 FINAL EXAM SOLUTIONS

Sm223 2010 MC solutions

1) D 2) D 3) E 4) B 5) C 6) B 7) D 8) B 9) E 10) C 11) E 12) A 13) B 14) D 15) C 16) D 17) X 18) C 19) X 20) A

Sm223 2010 FR solutions

21) a) Answers will vary [e.g. (0,0,9) , (3,0,0), (0,-3,0), etc.]

b) $x = 1 - t, y = 2 - 3t, z = 3 - 4t$ [note: any form of $x = x_0 + at, y = y_0 + bt, z = z_0 + ct$ is acceptable such that (x_0, y_0, z_0) is a point on the line and $\langle a, b, c \rangle$ is a scalar multiple of $\langle 1, 3, 4 \rangle$.]

22) a) At $t = 1$ second, the ball is 26.55 ft high.

b) The shot lands at $t \approx 2.3957$ seconds.

c) The shot lands 57.6 ft away from the athlete.

23) a) $L(x,y) \approx 2 + 2(x - 1) + \frac{1}{12} (y - 8)$

b) $L(1.1, 7.88) \approx 2 + 2(1.1 - 1) + \frac{1}{12} (7.88 - 8) \approx 2.19$

c) $|\text{correct value} - \text{estimated value}| = |2.1889 - 2.19| \approx .001$

24) a) If the company invests \$2000 in advertising and \$5000 in product development, it will sell 12000 widgets next year.

b) When the company invests \$2000 in advertising and \$5000 in product development, the company can sell 5 additional widgets per increase of \$1 investment in product development.

25) a) $\frac{dV}{dt} = \frac{dV}{dr} \frac{dr}{dt} + \frac{dV}{dh} \frac{dh}{dt}$

b) $\frac{dV}{dt} = \frac{2\pi rh}{3} \frac{dr}{dt} + \frac{\pi r^2}{3} \frac{dh}{dt}$

$$= \frac{5000\pi}{3} * .5 + \frac{25\pi}{3} * 12 = \frac{2800\pi}{3} \text{ cm}^3 / \text{yr}$$

26) a) $f_y = 12x - 3x^2 - 4xy$

b) critical points (0,0) (0,6) (4/3, 2) (4,0)

c) $f(0, 0)$ and $f(0, 6)$ and $f(4, 0)$ saddle points ; $f(4/3, 2)$ local max.

d) dimensions $4/3 \times 2 \times 4$; Maximum Volume = $xyz = (4/3)(2)(4) = 32/3$

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27) $f(x,y) = 13 + xy$

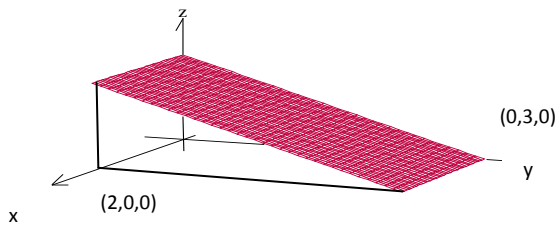
a) constraint $g = 3x + 4y = 600$

$\nabla f = \langle y, x \rangle \quad \lambda \nabla g = \langle 3\lambda, 4\lambda \rangle$

b) $y = 3\lambda$ and $x = 4\lambda$ and $3x + 4y = 600$

c) max occurs at $x = 100$ and $y = 75$

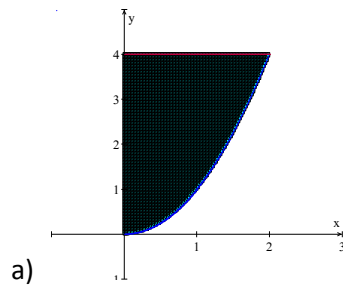
28) a)



b) $\int_0^2 \int_0^3 \int_0^{1-\frac{y}{3}} 1 \, dz \, dy \, dx = 3$

c) $\int_0^2 \int_0^3 \int_0^{1-\frac{y}{3}} (x^2 + y^2)y^2 \, dz \, dy \, dx = \frac{111}{5}$

29)



a)

b) $\int_0^4 \int_0^{\sqrt{y}} \frac{3}{1+y^{3/2}} \, dx \, dy$

c) $= 4 \ln(3) \approx 4.39$