MATH 151 Exam Answers 2009 Semester 1

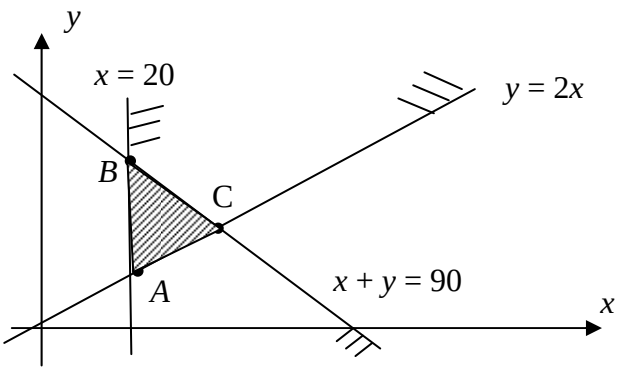
1. (a) $y = -(4/5)x + 4$ (b) $-4/5$ $(= -0.8)$ (c) 4 (d) $5/4$ $(= 1.25)$

2. (a) Let m = number of moro bars and c = number of crunchie bars
(i) $2m + 3c = 9.60$ (ii) $3m + 2c = 8.90$

(b) $c = \$2.20$

3. (a) (i) $x + y \le 90$ (ii) $x \ge 20$ (iii) $y \ge 2x$

(b)



(c) $P = 10x + 5y$

(d) Vertices: $A(20, 40)$, $B(20, 70)$, $C(30, 60)$

	$10x + 5y$
$A(20, 40)$	$200 + 200 = 400$
$B(20, 70)$	$200 + 350 = 550$
$C(30, 60)$	$300 + 300 = 600$ Maximum

Max profit $P = \$600$ when $x = 30$, $y = 60$.

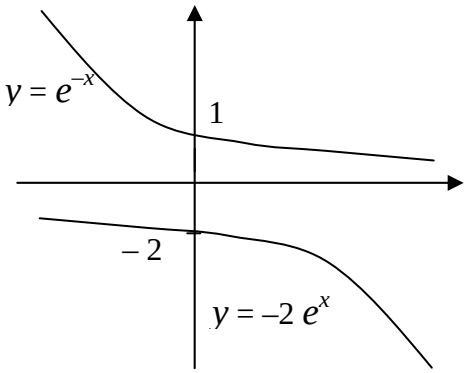
4. (a) $A = 4x^2 + 10x + 16x = 4x^2 + 26x$
(b) $x = 3/2$ (discard -8)

5. (a) $y = 2(x^2 - 6x + 10) = 2[(x - 3)^2 + 1] = 2(x - 3)^2 + 2$.
(b) Vertex $(3, 2)$, y-intercept 20.

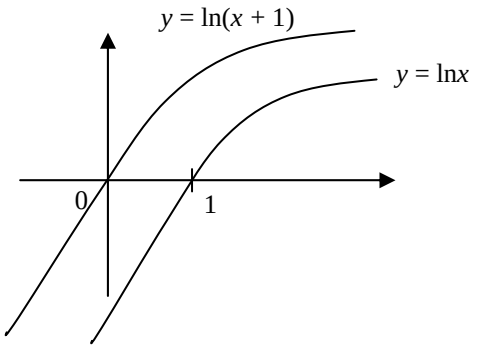
6. (a) $f(g(x)) = 2(3x^2 + 1) - 5 = 6x^2 - 3$

(b) $f^{-1}(x) = \dfrac{x+5}{2}$.

7. (a)



(b)

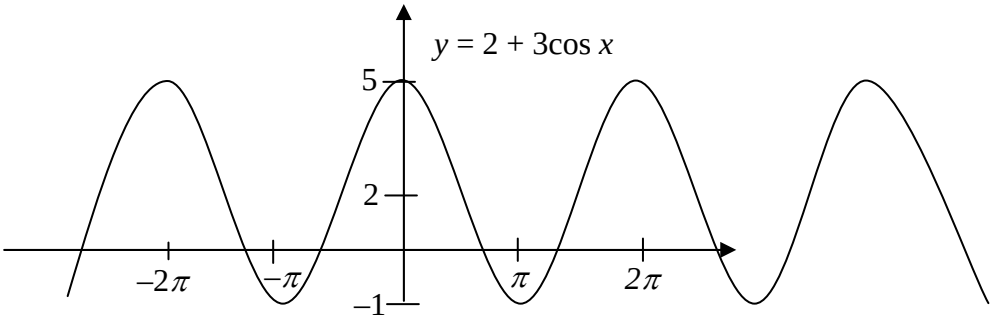


8. (a) $100(1.025)^{16} = \$148.45$ (b) \$164.15

(c) 44.5 six month periods

9. (a) $\sin\theta = -\frac{1}{2}$. (b) $\theta = \sin^{-1}(-0.5) = -30°$ or 330°.

(b)



10. (a) $A^{-1} = \begin{bmatrix} 3 & -4 \\ 2 & -3 \end{bmatrix} = A$ (b) $\begin{bmatrix} 3 & -4 \\ 2 & -3 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 7 \\ 4 \end{bmatrix}$

(c) $\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 & -4 \\ 2 & -3 \end{bmatrix}\begin{bmatrix} 7 \\ 4 \end{bmatrix} = \begin{bmatrix} 5 \\ 2 \end{bmatrix}$.

11. (a) 5 m/sec (b) $2 + h$ (c) $h = 0.002 \Rightarrow 2 + h = 2.002$

12. (a) 3 (b) $y - 2 = 3(x + 1)$.

13. (a) $A = 60x - 2x^2$ (b) $x = 15,\ A = 450$.

14. (a) $\frac{d^2y}{dx^x} = 6x - 6$ (b) $x < 1$

(c) $\frac{dy}{dx} = 3(x-1)^2$ so slope is zero at $x = 1$, but positive on either side so a point of inflection.

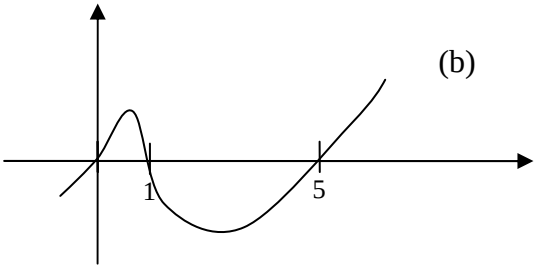
15. (a) $x = 2$ (b) $f''(x) = 2 + 8/x^2$ so $f''(2) > 0$. Therefore $x = 2$ local min.

(c) $x > 0$ (everywhere).

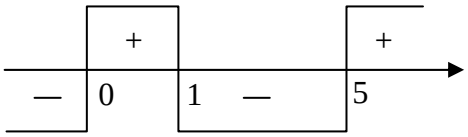
16. (a) $H'(t) = 4t^3 - 24t^2 + 20t$

(b) $H'(t) = 4t(t^2 - 6t + 5) = 12t(t - 1)(t - 5)$ so $t = 0, 1, 5$

(c)



(b)



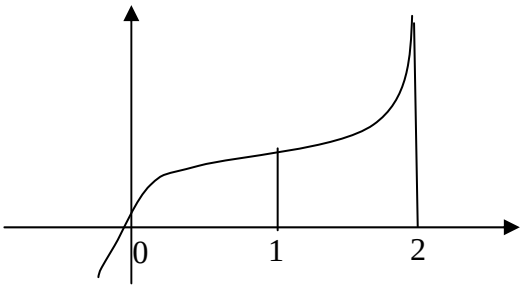
(d) Aircraft descending when $H(t)$ decreasing, when $H'(t) < 0$ so $1 < t < 5$.

(e) Local max at $t = 1$, $H(1) = 203$

(f) Local min at $t = 0$ or $t = 5$. $H(0) = 200$, $H(5) = 75$ and $H(t)$ increasing for $t > 5$ so the minimum height 75 occurs at $t = 5$.

17. (a) $(1/101)x^{101} - 4\,x^{3/2} + C$ (b) $\frac{1}{2}\,e^{2x} + 2\cos x + C$

18. (a) $I = 18$.



(b) Estimate of $I = 19$.

19. Area $= 2\int_{-2}^{2} (-6x^2 + 24)\,dx = 64$

20. (a) $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \ldots$

(b) $e = e^1 = 1 + 1 + \frac{1}{2!} + \frac{1}{3!} + \frac{1}{4!} = 2.7083$

(c) See notes