Homework 3 Solutions

1. (a) $2^{47/1200}$, $\sqrt[1200]{2^{47}}$, 1.028

   (b) $2^{-3/48}$, $\frac{1}{\sqrt[48]{2^{3}}}$, 0.889

   (c) $2^{2/3}$, $\sqrt[3]{2^{2}}$, 1.587

   (d) $2^{-3/4}$, $\frac{1}{\sqrt[4]{2^{3}}}$, 0.297

2. (a) 261.62 Hz (b) 77.78 Hz

   (c) 987.77 Hz (d) 207.65 Hz

   (a) 430.54 Hz (b) 645.08 Hz

   (c) 32.00 Hz (d) 101.59 Hz

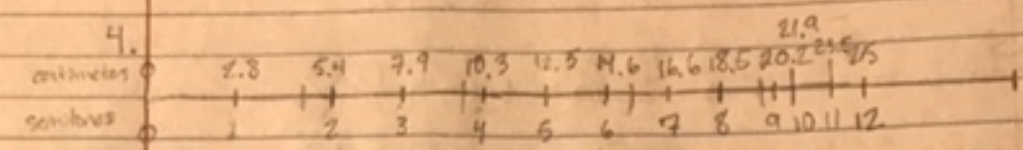
3. (a) G_3: 196.00 Hz, B_3: 246.94 Hz, D_4: 293.66 Hz

   (b) $A^{\flat}_4$: 415.30 Hz, $C^{\flat}_5$: 493.88 Hz, $E^{\flat}_5$: 622.25 Hz

   (c) D_3: 146.83 Hz, F_3: 174.61 Hz, A_3: 220 Hz, C_4: 261.62 Hz

   (d) $B^{\flat}_5$: 932.33 Hz, $D^{\flat}_6$: 1,108.73 Hz, $F^{\flat}_6$: 1318.51 Hz, $A^{\flat}_6$: 1,567.98

4.



5. (a) $\log_{10}(.0001) = \log_{10}10^{-4} = -4\log_{10}10 = -4$

(b) $\log_3 243 = \log_3 3^5 = 5\log_3 3 = 5$

(c) $\log_5 \sqrt[3]{25} = \log_5 5^{2/3} = \frac{2}{3}\log_5 5 = \frac{2}{3}$

(d) $\log_b\left(\frac{1}{\sqrt[n]{b^2}}\right) = \log_b b^{-\frac{2}{n}} = -\frac{2}{n}\log_b b = -\frac{2}{n}$

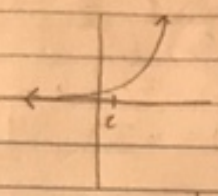
(e) $\log_3 11 + \log_3 17 = \log_3 187$

(f) $\log_4 5 - 2\log_4 2 = \log_4 5 - \log_4 4 = \log_4 \frac{5}{4}$

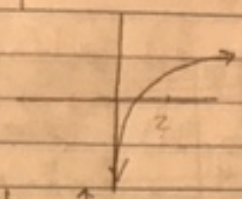
(g) $\log_2 13 + \log_4 21 = \log_2 13 + \log_2 \sqrt{21} = \log_2 13\sqrt{21}$

(h) $2\log_e x^2 - \frac{1}{2}\log_e x = \log_e x^4 - \log_e x = \log_e x^3$

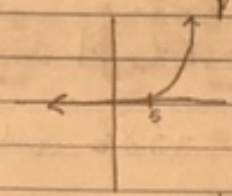
6. (a) $f(x) = 2^x$



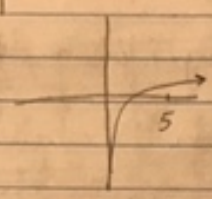
(b) $g(x) = \log_2 x$



(c) $r(x) = 5^x$



(d) $s(x) = \log_5 x$



The pairs (a) + (b) and (c) + (d) are inverses of each other.
The pair (a) + (c) differ by a horizontal stretch of $\frac{5}{2}x$. The pair (b) + (d) differ by a vertical stretch of

7. $\log_b \frac{x}{y} = \log_b x + \log_b \frac{1}{y} = \log_b x + \log_b y^{-1}$

$= \log_b x + (-1)\log_b y$

$= \log_b x - \log_b y$

8. (a) $7: 12(\log_2(7)) = 33.69$ st

(b) $0.3: 12(\log_2(.3)) = -20.84$ st

(c) $\frac{5}{2}: 12(\log_2 \frac{5}{2}) = 15.86$ st

(d) $\sqrt[4]{4}: 12(\log_2 \sqrt[4]{4}) = 6$ st

(e) $e: 12(\log_2 e) = 17.31$ st

(f) $.8: 1200(\log_2 .8) = -386$ cents

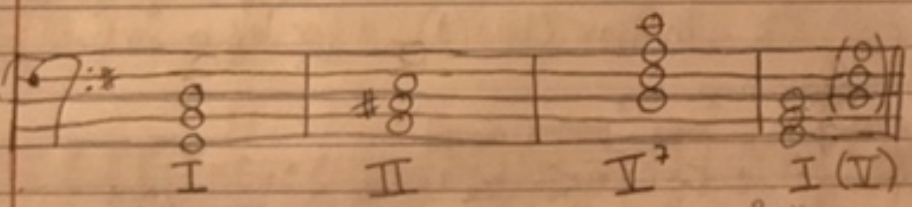
(g) $1.2: 1200(\log_2 1.2) = 316$ cents

(h) $\frac{3}{5}: 1200(\log_2 \frac{3}{5}) = -884$ cents

(i) $\frac{8}{3}: 1200(\log_2 \frac{8}{3}) = 1698$ cents

(j) $\pi: 1200(\log_2 \pi) = 1982$ cents

9.

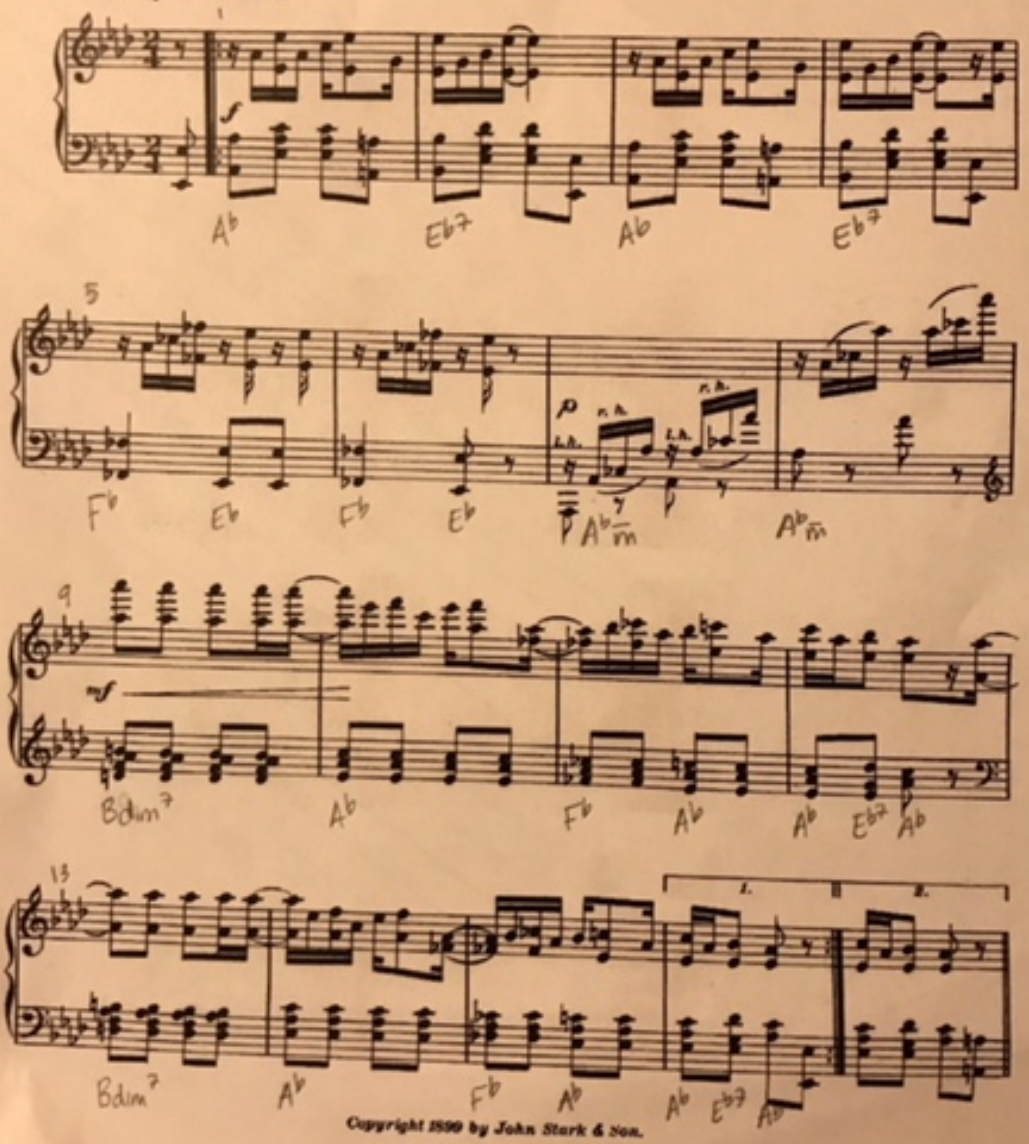


Both are possibilities.

MAPLE LEAF RAG.

BY SCOTT JOPLIN.

Tempo di marcia.



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