MATH 120 - Autumn 2002
Exam 2, Version 1 - Hints and Answers

1. ANSWER: 20 RPM

2. HINT: Recall that $f(x) = y \Leftrightarrow x = f^{-1}(y)$. You want $x = f^{-1}(5)$. So, set $f(x) = 5$ and solve for x.

   ANSWER: $f^{-1}(5) = -\frac{21}{2}$

3. ANSWER: The domain is the set of all real x except -2 and 6. The zeros are 1 and -3. The y-intercept is $\frac{1}{10}$. The lines $x = -2$ and $x = 6$ are the vertical asymptotes. The line $y = \frac{2}{5}$ is the horizontal asymptote.

4. (a) HINT: $\tan 25^\circ = \dfrac{96}{y}$ and $\tan 70^\circ = \dfrac{96+z}{y}$

   ANSWER: $y = 205.87$ and $z = 469.62$

   (b) HINT: $\cos\alpha = \dfrac{4.2}{5}$ and $\beta = \dfrac{\pi}{2} - \alpha$

   ANSWER: $x = 2.71$, $\alpha = 0.5735$ radians , $\beta = 0.9973$ radians

5. (a) HINT: The hard one is the t-coordinate of point b. Use the fact that there are six quarters of a period between points a and c, whose t-coordinates are 24 hours apart. So, $\frac{6}{4}$(period)=24, which means that the period is 16. Then there are three quarters of a period between point a and point b.

   ANSWER: $a = (3, 104.6)$, $b = (15, 101.6)$, $c = (27, 98.6)$

   (b) ANSWER: $A = 3$, $B = 16$, $C = 15$, $D = 101.6$

   (c) HINT: Set $100 = 3\sin\left[\frac{2\pi}{16}(t-15)\right] + 101.6$ and solve for t. This gives $t = 13.57$. Use symmetry and the fact that the sine curve is hitting a low point at $t = 11$ to find that temperature is equal to 100° at $t = 8.43$. Adding one period to this time gives $t = 8.43 + 16 = 24.43$, the time when the temperature next drops below 24 hours. In the first 24 hours, Lisa's temperature is above 100 from $t = 0$ to $t = 8.43$ and from $t = 13.57$ to $t = 24$.

   ANSWER: 18.86 hours

6. HINT: Write out the multi-part rule for $f(x)$ first.

   ANSWER: $f(x) + g(x) = \begin{cases} 0 & \text{if } x < -2 \\ -x-2 & \text{if } -2 \le x < 0 \\ x-2 & \text{if } 0 \le x \end{cases}$