MATH 112 SOLUTIONS FOR 5.6, P. 504

1. (b) $\frac{2}{11}$. (c) $\frac{6}{5}(2^{5/2}-1)$. (d) $\frac{381}{7}$. (f) $\frac{7}{16}$. (h) $3(2^{1/3}-1)$. (j) $\frac{2001}{32}$. (l) 6.
2. (b) $\frac{1}{2}$. (c) –4. (d) $\sqrt{2}-1$. (f) $-\frac{2}{\sqrt{3}}+\sqrt{2}$. (g) 2. (h) $-1+\sqrt{3}$. (j) $\frac{5}{2}\sqrt{2}-1$. (k) 1. (l) $-\frac{1}{3}$.
3. (b) $\frac{2}{\ln 3}$. (c) $1-\frac{1}{e}$. (d) $\frac{\sqrt{2}-1}{\sqrt{2}\ln 2}$. (f) $\ln\frac{5}{2}$. (g) $frac\pi 4$. (h) $\frac{\pi}{6}$. (j) $2\ln\frac{8}{5}-0.171$. (l) $\cosh 1-2\sinh 1-1$.
4. (b) x^3+x^{-1}. (c) $\cos 2x$. (d) $\dfrac{1}{x^2+1}$
5. Let $u=g(x)$. Then

$$\frac{d}{dx}\left(\int_a^{g(x)} f(t)dt\right)=\frac{d}{du}\left(\int_a^{u} f(t)dt\right)\frac{du}{dx}=f(u)\frac{du}{dx}=f(g(x))g'(x).$$

6. (b) $\dfrac{1}{2\sqrt{x}\left(\sqrt{x}+2\right)}$. (c) $26x^2+8$.

   (b) $s(T)=\int_0^T r(t)dt$.

   (c) (i) $a(T)=\frac{s(T)}{T}=\frac{1}{T}\int_0^T r(t)dt$. (ii) $a(T)$ is the slope of the line from the origin to the point $(T,s(T))$.

   (d) (i) $s(T)$ has maximum slope at about $T=5.5$ (ii) If $a(T)$ is maximum, then $a'(T)=0\Rightarrow\frac{s'(T)T-s(T)}{t^2}=0\Rightarrow s'(T)=\frac{s(T)}{T}=a(T)$. (iii) at about 5.5 weeks. (iv) Since $s'(T)=r(T)$, the condition is $r(T)=a(T)$. (v) When the current sales level r equals the running average a, then a is maximum. Beyond that, r is decreasing, which means that a will also be decreasing.

11. If $f(x)=A'(x)$ is increasing, $A(x)$ is concave upward. Similarly, if $f(x)=A'(x)$ is decreasing, then $A(x)$ is concave downward.