Answers

Autumn 2012 Math 125 Final Exam

1. (a) $2\ln\left|x+\sqrt{x^2+4}\right|+3\sqrt{x^2+4}+C$

   (b) $-\dfrac{\ln x}{1+x}+\ln|x|-\ln|x+1|+C$

2. (a) $\pi$

   (b) $\dfrac{1}{3}\left[\dfrac{1}{(\ln 6)^3}-\dfrac{1}{(\ln 9)^3}\right]$

3. $\pi$

4. $w'(1)=e\,\sin\left(\sqrt{e-1}\right)-2\,\sin(1)\approx 0.944$ cubic meters per hour

   The water volume is increasing at time $t=1$.

   $w'(3)=e^3\,\sin\left(\sqrt{e^3-1}\right)-6\,\sin(3)\approx -19.7576$ cubic meters per hour

   The water volume is decreasing at time $t=3$.

5. $1-\dfrac{1}{2^{1/3}}$

6. $\dfrac{21\pi}{2}$

7. $2.20317\times 10^{12}$ joules

8. (a) $\displaystyle\int_0^1 \sqrt{1+16x^3}\,dx$ meters

   (b) $\dfrac{1}{4}\left(1+2\sqrt{3}+\sqrt{17}\right)\approx 2.1468$ meters

9. $y=\ln\left(\dfrac{(x^2+1)^{3/2}+2}{3}\right)$

10. (a) $\dfrac{dy}{dt}=500-\dfrac{y}{100}$

    (b) $y(t)=50,000\left(1-e^{-t/100}\right)$ gm

    Concentration at $t=10$ is $\dfrac{y(10)}{1000}\approx 4.758$ gm/m$^3$. After 10 days, the fish are dead.