Review for Test 2 over 8.3, 8.4, 8.9, 9.3, 9.4, 10.1

1. Write out the form of the partial fraction decomposition (do not try to solve)

$$\frac{20x^3+12x^2+x}{(x^3-x)(x^3+2x^2-3x)(x^2+x+1)(x^2+9)^2}$$

2. Evaluate the integral

   (a) $\displaystyle\int (4x^2-25)^{-3/2}\,dx$

   (b) $\displaystyle\int \frac{(x-1)^2}{5\sqrt{24-x^2-2x}}dx$

   (c) $\displaystyle\int \frac{5x^2+x+12}{x^3+4x}dx$

3. Determine whether the given integral is convergent or divergent.

   (a) $\displaystyle\int_1^\infty \frac{4+\cos^4 x}{x}dx$

   (b) $\displaystyle\int_1^\infty \frac{3+\sin x}{x^2}dx$

   (c) $\displaystyle\int_0^\infty \frac{1}{\sqrt{x}+e^{4x}}dx$

4. Compute the following integrals or show that they diverge.

   (a) $\displaystyle\int_e^\infty \frac{dx}{x\ \ln^5 x}$

   (b) $\displaystyle\int_{-\infty}^0 (1+x)e^x\ dx$

   (c) $\displaystyle\int_{-\infty}^\infty \frac{5x^4}{(x^5+3)^3}dx$

   (d) $\displaystyle\int_0^{2017} \frac{1}{\sqrt{2017-x}}dx$

5. The curve $y=\sin x$ for $0\le x\le\pi$ is rotated about the x-axis. Set up, *but don't evaluate* the integral for the area of the resulting surface.

6. The curve $y=\dfrac{1}{2}\left(e^x+e^{-x}\right)$, $0\le x\le 1$, is rotated about the x-axis. Find the area of the resulting surface.

7. Set up, *but don't evaluate* the integral for the length of the curve $x=2t^2$, $y=t^3$, $0\le t\le 1$.

8. Find length of the curve $y=\dfrac{1}{\pi}\ln(\sec(\pi x))$ from the point $(0,0)$ to the point $\left(\dfrac{1}{6},\ln\dfrac{2}{\sqrt{3}}\right)$.

9. Determine if the sequence $\{a_n\}_{n=2}^\infty$ is decreasing and bounded:

   (a) $a_n=\ln n$

   (b) $a_n=\cos n^2$

(c) $a_n = e^{-n}$

(d) $a_n = e^n + 11$

(e) $a_n = 1 - \frac{1}{n^2}$

10. Determine if the sequence converges or diverges. If converges, find its limit.

(a) $\left\{ \dfrac{2017 + (-1)^n}{n^{2017}} \right\}_{n=1}^{\infty}$

(b) $\left\{ \dfrac{7n + 6n^3 + n^2}{(n+3)(n^2+8)} \right\}_{n=4}^{\infty}$

11. Assuming that the sequence defined recursively by $a_1 = 1$, $a_{n+1} = \dfrac{1}{2}\left(a_n + \dfrac{16}{a_n}\right)$ is convergent, find its limit.