Prince Sultan University

Department of Mathematics and Physical Sciences

Math 113
Final Exam
Semester I, Term 131
Thursday, January 2, 2014

Time Allowed: 120 minutes

Name:
Student Number:
Instructor's Name:

Statement of Ethics:

I agree to complete this exam without unauthorized assistance from any person, materials, or device.

Signature:

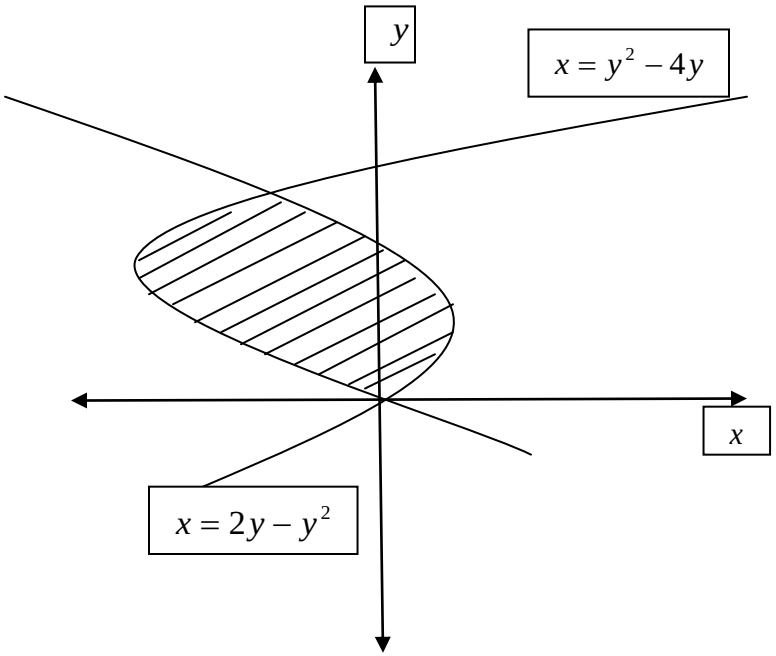
Total/80:

Total/40:

Q.1 (4 points) **Find the second derivative** (y'') **of the function** $y = \int_0^{3x^2+1} \sin(t)dt.$

Q.2 (3 points) **Write down the partial fraction decomposition of the function** $\frac{x^2-2x-1}{(x-1)^2(x^2+1)}$ **without the determination of the coefficients.**

Q.3 (5 points) **Find the area of the shaded region:**



Q.4 (4 points) **Use the method of the cylindrical shells to find the volume generated by rotating the region bounded by the curves** $y = x^2$ **and** $y = 2 - x^2$ **about** $x = 1$. **Set up the integral and do not evaluate it.**

Q.5 ((a): 4 points, (b): 6 points, (c): 4 points, (d): 4 points) **Evaluate the integrals:**

a) $\int (2x-3)(4x^2 + x^{\frac{1}{2}})dx$

b) $\int \frac{\sqrt{x^2-9}}{x^3} dx$

c) $\int \frac{(x-1)e^x}{x^2} dx$ (Hint: Use integration by parts).

d) $\int_0^{\pi/3} \tan^5 x \sec^4 x dx$

Q.6 ((a):5 points, (b): 4 points) **Determine whether the integrals are convergent or divergent. If they converge evaluate them:**

a) $\int_0^{\infty} \frac{x^2}{\sqrt{1+x^3}} dx$

b) $\int_2^{\infty} xe^{-3x}dx$

Q.7 (5 points) **Find the exact length of the curve** $y = 2(x+4)^{\frac{3}{2}},\ 0 \le x \le 2,\ \ y > 0.$

Q.8 ((a): 5 points, (b): 6 points, (c): 4 points, (d): 5 points) **Test the series for convergence and divergence:**

a) $\sum_{n=1}^{\infty} \frac{\sin 2n}{1+2^n}$

b) $\sum_{n=1}^{\infty}(-1)^n \frac{\sqrt{n}}{2n+3}$

c) $\sum_{n=1}^{\infty}\frac{n^2-5n}{n^3+n+1}$

d) $\sum_{n=1}^{\infty}\frac{e^{1/n}}{n^2}$

Q.9 (5 points) **Determine whether the series** $\sum_{n=1}^{\infty}\left(\frac{-2n}{n+1}\right)^{5n}$ **is absolutely convergent, conditionally convergent or divergent.**

Q.10 (7 points) **Find the radius and interval of convergence of the series** $\sum_{n=1}^{\infty}\frac{(2x-1)^n}{5^n\sqrt{n}}$ **.**