Name _____ Calculus I, Test 3, Spring 2017

Please show all your work and circle your answer when appropriate. You do not need to simplify answers unless the problem specifies to do so.

1) Find the integral below. (4 points)

$$\int x^{3.6} dx$$

2) Find the integral below. (4 points)

$$\int_2^7 x^{3.6} dx$$

3) Find the integral below. (4 points)

$$\int \sec^2(x)\, dx$$

4) Find the integral below. (4 points)

$$\int \frac{3}{1+(2x)^2}\, dx$$

(Note: Problem #5 below counts for 20 points because I'm going to be meticulously looking at the details in your work. For full credit show every step of your work and simplify your answer.)

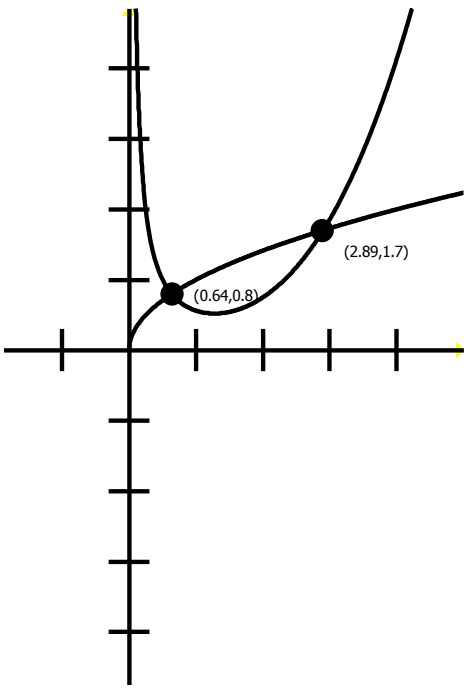
5) Find the integral below. (20 points)

$$\int_{-1}^{2} x^2 e^{x^3+1} dx$$

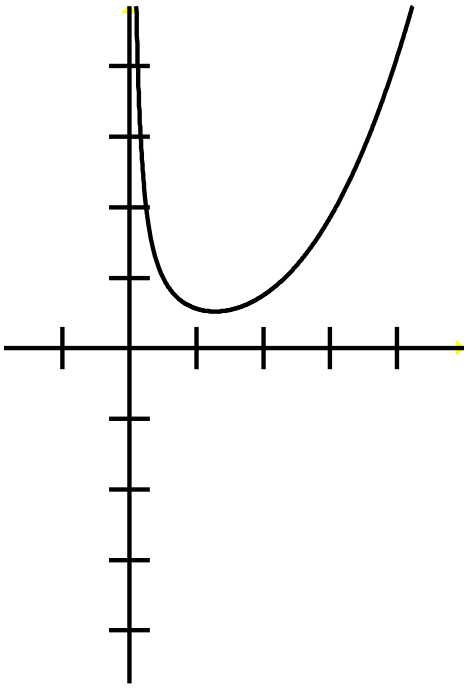
6) Find the integral below. (6 points)

$$\int x^9 \sin(x^{10})\, dx$$

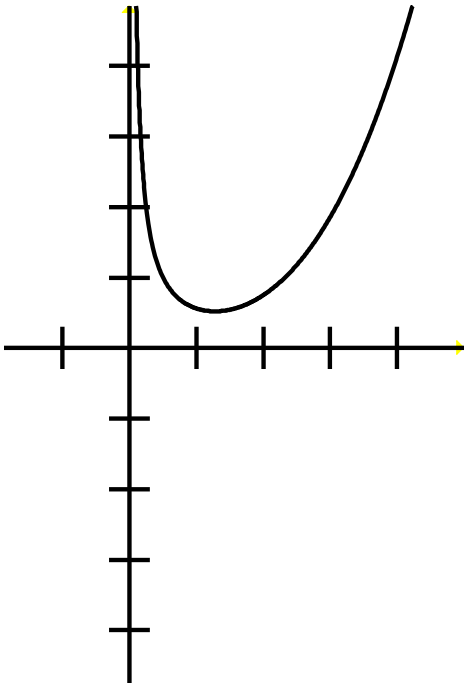
7) The curves shown below are given by $y = \frac{x^3}{24} + \frac{1}{2x}$ and $y = \sqrt{x}$.
Set up the integral for the area bounded between the two curves.
Do not evaluate the integral. (6 points)



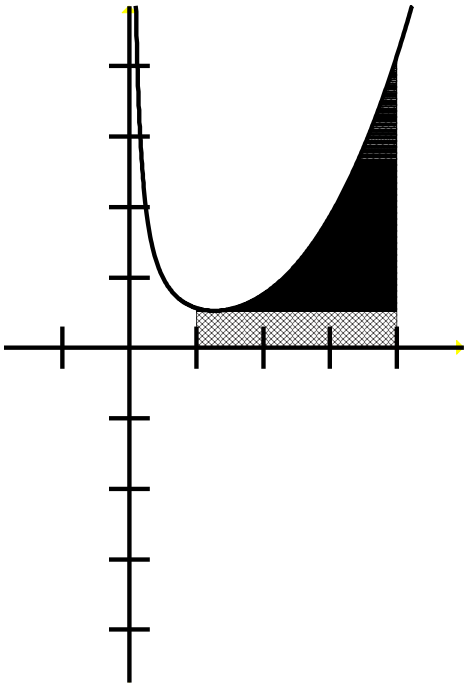
8) The curve shown below is given by $y = \frac{x^3}{24} + \frac{1}{2x}$. Set up the integral for the length of the piece between $x = 1$ and $x = 4$. Do not evaluate the integral.
(4 points)



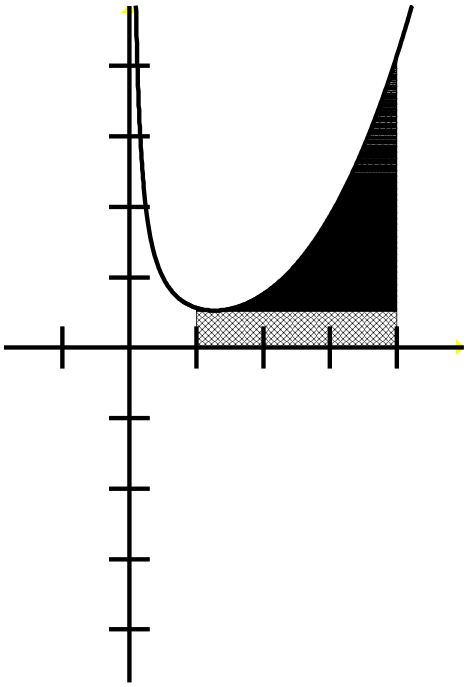
9) The curve shown below is given by $y = \frac{x^3}{24} + \frac{1}{2x}$. Suppose the piece between $x = 1$ and $x = 4$ is rotated around the x-axis. Set up the integral for the surface area of the surface created. Do not evaluate the integral.
(4 points)



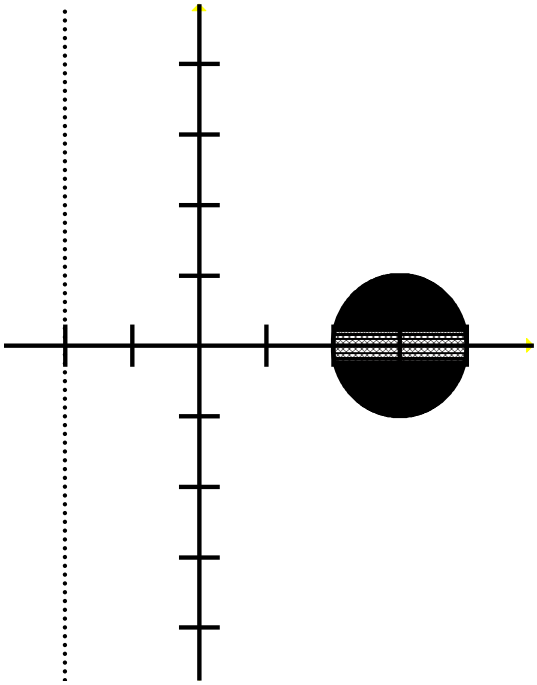
10) The curve shown below is given by $y = \frac{x^3}{24} + \frac{1}{2x}$. Suppose the shaded region is rotated around the x-axis. Set up the integral for the volume of the solid created. Do not evaluate the integral.
(4 points)



11) The curve shown below is given by $y = \frac{x^3}{24} + \frac{1}{2x}$. Suppose the shaded region is rotated around the y-axis. Set up the integral for the volume of the surface created. Do not evaluate the integral.
(4 points)



The curve shown below is given by the pair of equations $y = \sqrt{1-(x-3)^2}$ and $y = -\sqrt{1-(x-3)^2}$. Together they bound the shaded region shown here.



12) What is the area of the shaded region? (1 point)

13) If the shaded region is rotated around the line $x = -2$, describe what the solid shape created looks like. (4 points)

14) Set up, but do not evaluate, the integral for the volume of the solid described in the previous question. (6 points)

15) The velocity of an object moving along a line is given by $v(t) = 9 - t^2$ meters per second on the interval $[0,4]$. The position of the same object is given by $s(t)$. Unfortunately all that is known about $s(t)$ is that the starting position is given by $s(0) = -2$. Find a formula for $s(t)$. (10 points)

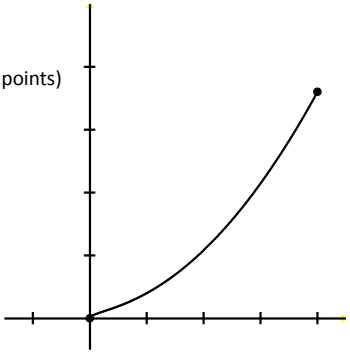
16) Evaluate the expression below. (3 points)

$$\frac{d}{dx}\int_3^x (t^2 + t + 1)dt$$

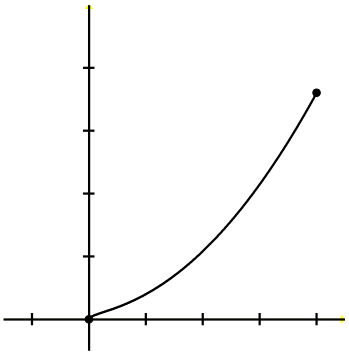
17) Evaluate the expression below. (2 points)

$$\frac{d}{dx}\int_3^{x^2} (t^2 + t + 1)dt$$

18) Illustrate (do not calculate) the area under the curve given below. (2 points)



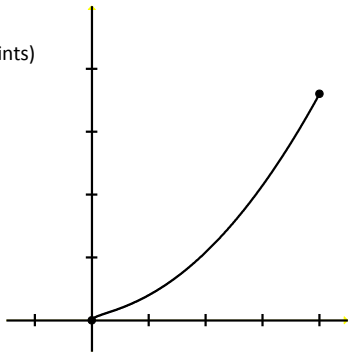
19) Illustrate (do not calculate) an approximation to the area under the curve given below. (2 points)



20) Calculate the approximation you illustrated in #19. (2 points)

21) Is your approximation in #19 an overestimate or an underestimate? (1 point)

22) Illustrate a better approximation than you came up with in #19. (2 points)



23) Illustrate an even better approximation than you came up with in the previous question. (1 points)