Mathematics 1101Y – Calculus I: Functions and calculus of one variable
TRENT UNIVERSITY, 2012–2013

Quizzes

Quiz #0. Friday, 14 September, 2012. *[15 minutes]*

Mathematicians in medieval India traditionally wrote up much of their work in verse. The problem below was posed by Bhaskara (*c.* 1114-1185 A.D.) in a book dedicated to his daughter Lilavati:

> The square root of half the number of bees in a swarm
> Has flown out upon a jasmine bush;
> Eight ninths of the swarm has remained behind;
> And a female bee flies about a male who is buzzing inside a lotus flower;
> In the night, allured by the flower's sweet odour, he went inside it
> And now he is trapped!
> Tell me, most enchanting lady, the number of bees.

1. Restate the problem given above as an equation. *[5]*

Bonus. Solve the equation you obtained in your solution to **1**. *[1]*

NOTE: For those interested in the history of mathematics, Bhaskara developed a number of techniques that anticipated portions of both differential and integral calculus. The translation given above of Bhaskara's problem is taken from *The Heritage of Thales*, by W.S. Anglin & J. Lambeck, Springer Verlag, New York, 1995, ISBN 0-387-94544-X, p. 113. Just in case you look up Bhaskara, there was also an earlier (*c.* 600-680 A.D.) notable Indian mathematician with the same name. They sometimes end up being numbered to distinguish them.

Quiz #1. Friday, 21 September, 2012. *[10 minutes]*

Consider the parabola $y = x^2 + 4x - 5$.

1. Find the x-intercepts of the parabola. *[2]*
2. Find the coordinates of the vertex of the parabola. *[2]*
3. Sketch the graph of the parabola. *[1]*

Quiz #2. Friday, 28 September, 2012. *[10 minutes]*

1. Find the inverse function, as best you can, of $f(x) = \dfrac{2e^x}{e^x + 1}$. *[5]*

Quiz #3. Friday, 5 October, 2012. *[10 minutes]*

1. Compute $\lim\limits_{x \to 1} \dfrac{x^4 - 1}{x - 1}$. *[5]*

Quiz #4. Friday, 12 October, 2012. *[10 minutes]*

1. Compute $\lim\limits_{x \to \infty} \dfrac{x^2}{(3x + 1)^2}$. *[5]*

Quiz #5. Friday, 2 November, 2012. *[10 minutes]*

1. Compute $\dfrac{d}{dx}\left(\dfrac{\cos^2(x)}{e^x}\right)$. *[5]*

Quiz #6. Friday, 9 November, 2012. *[15 minutes]*

1. Elvis and Solovey start running from the origin at the same time. Elvis runs up the y-axis at 8 m/s and Solovey runs right along the x-axis at 6 m/s. How is the area of the triangle whose corners are the origin, Elvis, and Solovey, changing 2 s after the start? *[5]*

   Note: Just in case, the area of triangle with base b and height h is $\frac{1}{2}bh$.

Quiz #7. Friday, 16 November, 2012. *[15 minutes]*

1. Find the domain and all the intercepts, vertical and horizontal asymptotes, maximum and minimum points, and points of inflection of $f(x) = xe^{-x}$ and sketch its graph using this information. *[5]*

Quiz #8. Friday, 23 November, 2012. *[10 minutes]*

1. Find the maximum and minimum values of $f(x) = x^3 - 2x^2 + x$ on the interval $[-1, 1]$. *[5]*

Quiz #9. Friday, 30 November, 2012. *[10 minutes]*

Do *one* (1) of questions 1 or 2 below.

1. Find the maximum area of a right triangle whose hypotenuse has length $\sqrt{8}$ m. *[5]*
2. Compute $\displaystyle\int_0^{\pi/4} \cos(2x)\,dx$. *[5]*

Quiz #10. Wednesday, 5 December, 2012. *[10 minutes]*

1. Compute $\displaystyle\int 26x^{12}\ln(x)\,dx$. *[5]*

Quiz #11. Friday, 11 January, 2013. *[10 minutes]*

1. Find the area between the curves $y = x\ln(x)$ and $y = x$ for $1 \le x \le e$. *[5]*

Quiz #12. Friday, 18 January, 2013. *[12 minutes]*

Consider the solid obtained by revolving the region between $y = \sqrt{x}$ and $y = x^2$, for $0 \le x \le 1$, about the x-axis.

1. Sketch this solid and find its volume. *[5]*

Quiz #13. Friday, 25 January, 2013. *[12 minutes]*

Consider the solid obtained by revolving the region between $y = e^x$ and $y = e$, for $0 \le x \le 1$, about the y-axis.

1. Sketch this solid and find its volume. *[5]*

Quiz #14. Friday, 8 February, 2013. *[12 minutes]*

1. Compute $\displaystyle\int \frac{2}{x^3 - x}\, dx$. *[5]*

Quiz #15. Friday, 15 February, 2013. *[25 minutes]*

1. Compute $\displaystyle\int_0^\infty \frac{x^2 + 3x + 3}{(x+1)\,(x^2 + 2x + 2)}\, dx$. *[5]*

Quiz #16. Friday, 1 March, 2013. *[15 minutes]*

Do *one* (1) of questions 1 or 2 below.

1. Find the arc-length of the curve $y = \dfrac{x^2}{2}$ for $0 \leq x \leq 1$. *[5]*
2. Find the area of the surface obtained by revolving the curve $y = \dfrac{x^2}{2}$ for $0 \leq x \leq 1$ about the y-axis. *[5]*

Quiz #17. Friday, 8 March, 2013. *[15 minutes]*

Do *one* (1) of questions 1 or 2 below.

1. Find the arc-length of the polar curve $r = e^\theta$ for $0 \leq \theta \leq \ln(2)$. *[5]*
2. Find the area of the region between the origin and the polar curve $r = e^\theta$ for $0 \leq \theta \leq \ln(2)$. *[5]*

Quiz #18. Friday, 15 March, 2013. *[10 minutes]*

1. Determine whether the series $\displaystyle\sum_{n=0}^{\infty} \frac{1}{2^n + n}$ converges or diverges. *[5]*

Quiz #19. Friday, 22 March, 2013. *[10 minutes]*

1. Determine whether the series $\displaystyle\sum_{n=0}^{\infty} \frac{2^n e^n}{n! 3^n}$ converges or diverges. *[5]*

Quiz #20. Thursday, 28 March, 2013. *[10 minutes]*

1. Determine for which values of x the power series $\displaystyle\sum_{n=0}^{\infty} \frac{n x^n}{5^n}$ converges and for which it diverges. *[5]*

Quiz #21. Friday, 5 April, 2013. *[15 minutes]*

1. Find the Taylor series at 0 of $f(x) = \dfrac{x}{1+x} - 1$ and find its radius of convergence. *[5]*