Name:_____

      (Last Name)   (First Name)

Student Number:_____

This test consists of 20 multiple choice questions worth 1 mark each (no part marks), and 1 question worth 1 mark (no part marks) on proper computer card filling. All questions must be answered on the COMPUTER CARD with an HB PENCIL. Marks will not be deducted for wrong answers (i.e., there is no penalty for guessing). You are responsible for ensuring that your copy of the test is complete. Bring any discrepancy to the attention of the invigilator. Only the McMaster standard calculator Casio fx-991 is allowed.

1.   Find the value of a if

$$\left(\frac{x^2}{x^{-5/2}}\right)^{-1/4} \sqrt{x^3} = x^a$$

(a) $\dfrac{1}{2}$ (b) $\dfrac{3}{8}$ (c) $\dfrac{3}{4}$ (d) $\dfrac{5}{8}$ (e) $\dfrac{1}{4}$

2.   Find all real values of x that satisfy the following equation.

$$\left(\frac{1}{25}\right)^{30-x^2} = 5^{14x}$$

(a) 3, -10 (b) -6, 5   (c) 5, -6   (d) -3, 10 (e) -3, 6

3.   Find the values of C and a so that the curve $y = C 2^x$ contains the points *(2,3)* and *(a,6)*.

(a) $C = \dfrac{3}{4}, a = 3$ (b) $C = \dfrac{2}{3}, a = 4$ (c) $C = \dfrac{3}{4}, a = 4$ (d) $C = \dfrac{3}{2}, a = 3$ (e) $C = \dfrac{1}{2}, a = 2$

4.   Suppose that $4000 is invested at an annual rate of 7%. Compute the balance after 5 years if the interest is compounded quarterly.

(a) $5624.18 (b) $5676.27 (c) $5659.11 (d) $5642.40 (e) $5610.21

5.   How much money should be invested at 6% to obtain $10000 in 15 years if interest is compounded continuously?

(a) $4132.98 (b) $4038.71 (c) $4121.48 (d) $4092.96 (e) $4065.70

6. Use the laws of logarithms to expand and simplify the following expression

$$\ln\left(\frac{x+2}{\sqrt{x}(x-1)}\right)$$

(a) $-\dfrac{1}{2}\ln x$ (b) $-\dfrac{1}{2}\ln x+\ln(x+2)-\ln(x-1)$ (c) $\dfrac{3}{2}\ln x$ (d) $-\ln\sqrt{x}+\ln 1$

(e) $\dfrac{\ln(x+2)}{\frac{1}{2}\ln x\ln(x-1)}$

7. Solve the following equation for x.

$$\frac{17\,e^{9x}}{e^{9x}+9}=8$$

(a) $\dfrac{1}{17}\ln\dfrac{9}{8}$ (b) $\dfrac{1}{17}\ln\dfrac{8}{9}$ (c) $\dfrac{1}{9}\ln 8$ (d) $\dfrac{1}{8}\ln 9$ (e) $\dfrac{1}{9}\ln\dfrac{8}{17}$

8. Solve the following equation for x

$$\ln x-\ln\left(\frac{4x}{x-2}\right)=\ln 3$$

(a) $\dfrac{3}{4}$ (b) $\dfrac{3}{2}$ (c) 11 (d) $\dfrac{2}{3}$ (e) 14

9. Suppose that you invest $5000 at an annual interest rate of 4% compounded continuously. How long will it take (in years) for your money to triple?

(a) 17.21 (b) 27.47 (c) 17.33 (d) 25.62 (e) 28.51

10. A hot drink is taken outside on a cold winter day when the air temperature is -10°C. According to a principle of physics called Newton's Law of Cooling, the temperature T (in degrees Celsius) of the drink t minutes after being taken outside is given by

$$T(t)=-10+Ae^{-kt}$$

,where A and k are constants. Suppose that the temperature of the drink is 89°C when it is taken outside, and that 20 minutes later the drink is 26°C. When (i.e., after how many minutes) will the temperature reach 0°C?

(a) 53.67 (b) 44.92 (c) 51.16 (d) 48.17 (e) 45.32

11. Find $f'(t)$ if

$$f(t)=\frac{e^{2t}}{t+1}$$

(a) $\dfrac{(2t+1)e^{2t}}{(t+1)^2}$ (b) $2e^{2t}$ (c) $\dfrac{2t(t+1)e^{2t-1}-e^{2t}}{(t+1)^2}$ (d) $\dfrac{te^{2t}}{(t+1)^2}$ (e) $\dfrac{2e^{2t}-1}{(t+1)^2}$

12.   Find $f'(2)$ if

$$f(x)=\ln(7x^4)$$

(a) $\dfrac{1}{112}$ (b) $\dfrac{7}{16}$ (c) 2   (d) $\dfrac{15}{7}$ (e) 14

13. Find the second derivative of

$$h(x)=(x^2+2)e^x$$

(a) $(x^2+2x+2)e^x$ (b) $(x^2+4x+4)e^x$ (c) $2e^x$ (d) $2x(x-1)e^{x-2}$ (e) $(2x+2)xe^{x-1}$

14.   Let

$$f(x)=xe^{1-2x^2}$$

Find the largest interval(s) on which x is increasing.

(a) $(-\infty,-2),(2,\infty)$ (b) $(-2,2)$ (c) $(-\infty,-\frac{1}{2}),(\frac{1}{2},\infty)$ (d) $(-\frac{1}{2},\infty)$ (e) $(-\frac{1}{2},\frac{1}{2})$

15.   Find the equation of the line that is tangent to the graph of the function

$$f(x)=\ln(5x+3)$$

at the point $(0,\ln 3)$.

(a) $y=\dfrac{5}{3}x+\ln 5$ (b) $y=\dfrac{1}{3}x+\ln 5$ (c) $y=\dfrac{1}{5}x+\ln 3$ (d) $y=\dfrac{3}{5}x+\ln 5$

(e) $y=\dfrac{5}{3}x+\ln 3$

16.   Find the smallest value (i.e., absolute minimum) of the function

$$f(x)=x\ln x$$

on the interval $1 \leqslant x \leqslant 2$.

(a) $-\dfrac{1}{e}$ (b) $\dfrac{1}{e}$ (c) 0   (d) 1   (e) 2

17.   Evaluate the following integral,

$$\int x(x^2+4)^{20}\,dx$$

(a) $\dfrac{1}{42}(x^2+4)^{21}+C$ (b) $\dfrac{1}{21}(x^2+4)^{21}+C$ (c) $\dfrac{1}{2}x^2\left(\dfrac{1}{3}x^2+4x\right)^{20}+C$

(d) $\dfrac{1}{2}x^2\dfrac{1}{21}(x^2+4)^{21}+C$ (e) $10(x^2+4)^{19}+C$

18.   Evaluate the following integral.

$$\int x\left(x^2+\dfrac{2}{x^2}\right)dx$$

(a) $\dfrac{1}{2}x^2\left(\dfrac{1}{3}x^2-\dfrac{2}{x}\right)+C$ (b) $\dfrac{1}{4}x^4+2\ln|x|+C$ (c) $\dfrac{1}{4}x^4-\dfrac{2}{x^2}+C$

(d) $\dfrac{1}{2}x^2\left(\dfrac{1}{3}x^3+2\ln x^2\right)+C$ (e) $\dfrac{1}{3}x^2+2\ln|x|+C$

19.   Suppose that the slope at each point (x,y) on the curve $y=f(x)$ is given by

$$f'(x)=\dfrac{\ln x}{x}$$

and that the function passes through the point (1,2). Find f(x) .

(a) $\ln(\ln x)+2$ (b) $\dfrac{1}{2}(\ln x)^2+2$ (c) $(\ln x)^2+2$ (d) $\ln x^2+2$ (e) $e^{\ln x}+2$

20.   Solve the following initial value problem
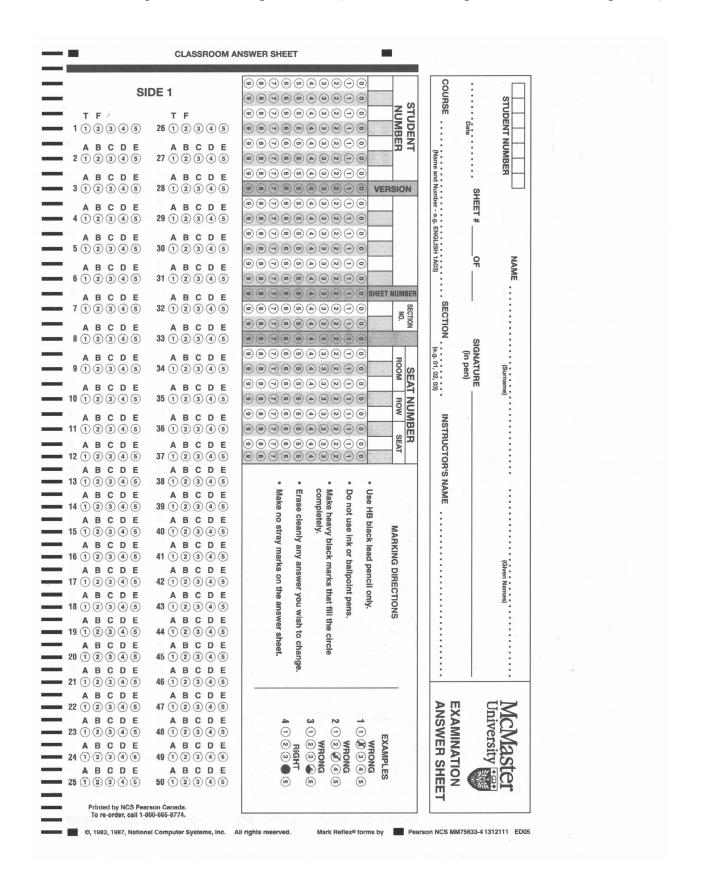
$$\dfrac{dy}{dx}=\dfrac{1}{\sqrt{x}}-\dfrac{1}{x^2}$$

where $y=2$ when $x=1$.

(a) $\sqrt{x}+\dfrac{2}{x}-1$ (b) $2\sqrt{x}-\ln x^2$ (c) $2\sqrt{x}+\dfrac{1}{x}-1$ (d) $-\dfrac{1}{2\sqrt{x^3}}+\dfrac{2}{x^3}+\dfrac{1}{2}$

(e) $2\ln\sqrt{x}-2\ln x^2+2$

21. Correctly fill out the bubbles corresponding to your student number and the version number of your test in the correct places on the computer card. (Use the below computer card for this sample test.)

Answers for Sample Test #1

1. b **2.** d **3.** a **4.** c **5.** e **6.** b **7.** c **8.** e **9.** b **10.** e **11.** a **12.** c **13.** b **14.** e

15. e **16.** c **17.** a **18.** b **19.** b **20.** c

21. NOTE: On the sample tests, a version number is not given. On the actual tests, it will say "Version X" at the top, where X is the version number that you will have to fill in on the computer card. The sample answer above assumes that the test says "Version 3" at the top. On the actual test you will have to fill in the bubble corresponding to the version number of YOUR test (which may or may not be Version 3). The sample below also assumes that your student number is 8816132. On the actual test, you will have to fill in the bubbles corresponding to YOUR student number (not 8816132). Please also check the website for instructions.