BC Calculus Units 6-8 Quiz Review WS 1

Evaluate the below: Show all work!

1) $\int \frac{2x}{3} \ln 4x \, dx$

2) (Show your work – non- calculator)

$$\int_0^6 \frac{1}{\sqrt{6-x}} \, dx$$

3) $\int (3x + 1) \cos 5x \, dx$

4) $\int x^3 e^{2x}\, dx$

5) $\int \frac{1}{x^2+6x+8}\, dx$

6) $\int_0^{\infty} \frac{1}{9+x^2}\, dx$

7) Given that $y = f(t)$ is a solution to the logistic differential equation $\frac{dy}{dt} = \frac{y}{5} - \frac{y^2}{1500}$, where t is time in years. What is $\lim_{t \to \infty} f(t)$?

8)

Let $y = f(x)$ be the solution to the differential equation $\frac{dy}{dx} = 3x + y$ with initial condition $f(0) = 1$. What is the approximation for $f(0.5)$ obtained using Euler's method with 2 steps of equal length, starting at $x = 0$?

9)

The table below gives the values of f', the derivative of f. If $f(4.2) = 5$, what is the approximation to $f(4.6)$ obtained by using Euler's method with 2 steps of equal size?

x	4	4.2	4.4	4.6	4.8
$f'(x)$	0.2	0.3	0.5	0.61	0.73

10) $\lim_{x \to 0+} x^{x^2}$

11) $\lim_{x \to \infty} (1 + x^2)^{1/x}$

12) $\lim_{x \to 0} (\cos x)^{1/x}$

13) Find an integral that is equal to the length of the curve $f(x) = 3x^4 + x^2 - 2x + 1$ from the points $(0,1)$ to $(2, 49)$. **Do Not Evaluate.**

14) The length of the curve $y = 2x^3$ from $x = 1$ to $x = 5$ is given by

A. $\int_1^5 \sqrt{1 + 4x^4}\, dx$

B. $\int_1^5 \sqrt{1 + 6x^2}\, dx$

C. $\int_1^5 \sqrt{1 + 36x^4}\, dx$

D. $\int_1^5 \sqrt{1 + x^6}\, dx$

E. $\int_1^5 \sqrt{1 + 36x^3}\, dx$

Formulas to know(memorize) for quiz:

1) Integration by Parts (IBP): $\int \boldsymbol{fg'} = \boldsymbol{fg} - \int \boldsymbol{f'g}$ Use original IBP formula if log or natural log is involved. Can only use Tab method if no logs is in the integrand

2) Improper Integrals: Remember to take limit to approach a bound that is ∞ or a point of discontinuity (vertical asymptote)

3) Partial Fraction Decomposition: Use the "cover-up" method when breaking down rational functions into separate fractions each with its own linear factor. Integral of these separate expressions will be in the form of $\int \frac{1}{u} du = \ln|u| + C$

4) Euler's Method: Create Table:

x	y_o	y' or $\frac{dy}{dx}$ or $f'(x)$	$y = y_o + y'(\Delta x)$

- $\Delta x = \frac{b-a}{n}$

5) Logistic Differential Equation: $\frac{\boldsymbol{dy}}{\boldsymbol{dt}} = \boldsymbol{ky}(\boldsymbol{1} - \frac{\boldsymbol{y}}{\boldsymbol{L}})$ or $\frac{dy}{dt} = \frac{k}{L} y(L - y)$

6) Arc Length of Curve Formula: $L = \int_a^b \sqrt{1 + [f'(x)]^2}\, dx$

7) L'Hopital's Rule: For indeterminate form in terms of $(variable)^{(variable)}$, use log differentiation to arrange in a form that L'Hopital's Rule can be applied: $\lim_{x \to a} \frac{f(x)}{g(x)} \rightarrow \lim_{x \to a} \frac{f'(x)}{g'(x)}$