BC Calculus Units 6-8 Quiz Review WS 3

Evaluate the below: Show all work!

1)

The function f has a continuous derivative. The table gives the values of f and its derivatives for $x = 1$ and $x = 6$. If $\int_1^6 f(x)\,dx = 9$, what is the value of $\int_1^6 3xf'(x)\,dx$?

x	$f(x)$	$f'(x)$
1	2	4
6	8	-3

2) $\int 4xe^{3x+2}dx$

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

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

5) $\int_0^3 \frac{1}{\sqrt{9-x^2}}\ dx$

6)

Let $h(x) = \int_1^x \frac{1}{t^2} dt$. Use Euler's method, starting at $x = 1$ with two steps of equal size, to approximate $h(3)$.

7)

The table below gives the values of f', the derivative of f. If $f(2) = 1$, what is the approximation to $f(2.3)$ obtained by using Euler's method with 3 steps of equal size?

x	2	2.1	2.2	2.3
$f'(x)$	-0.1	-0.15	-0.3	-0.5

8)

A populations rate of growth is modeled by the logistic differential equation $\frac{dP}{dt} = \frac{1}{400}P(100 - P)$, where t is in days and $P(0) = 10$. What is the greatest rate of change for this population?

9)

Using the logistic differential equation $\frac{dP}{dt} = \frac{1}{3}P - \frac{1}{120}P^2$, what is $\lim_{t\to\infty} P(t)$?

10)

A rate of change $\frac{dP}{dt}$ of a population is modeled by a logistic differential equation. If $\lim_{t\to\infty} P(t) = 100$ and the rate of change of the population is 5 when the population size is 20, which of the following differential equations describe the situation?

A. $\frac{dP}{dt} = 5P\left(1 - \frac{P}{20}\right)$

B. $\frac{dP}{dt} = 20P\left(1 - \frac{P}{100}\right)$

C. $\frac{dP}{dt} = \frac{5}{16}P\left(1 - \frac{P}{100}\right)$

D. $\frac{dP}{dt} = \frac{16}{5}P\left(1 - \frac{P}{100}\right)$

11)

A rate of change for a population is modeled by the differential equation $\frac{dP}{dt} = 0.3P(66 - P)$. What is the population when the rate of change is the greatest?

12) **No Calculator.** Suppose $F(x) = \int_0^x \sqrt{3 - 4\cos^2 t}\ dt$. What is the length of the arc along the curve $y = F(x)$ for $0 \le x \le \frac{\pi}{3}$?

13)

Let R be the region bounded by the graphs of $f(x) = x^2 + 1$ and $g(x) = -x^2 + 5$. Write an expression including one or more integrals that gives the length of the region R. **Do Not Evaluate.**

14) $\lim_{x \to \infty} (x + 1)^{e^{-x}}$

15) $\lim_{x \to \pi/2^-} (\sin x)^{\tan x}$