Name_____ Date_____ Punctuation Mark_____

BC Calculus: TEST 6.1 – 6.6. NO CALCULATOR, NO CALCULATOR

Part I: Multiple Choice—Put the correct letter to the left of each problem

_____ 1. What is the area of the region between the graphs of $y = x^2$ and $y = -x$ from $x = 0$ to $x = 2$?

(A) 2/3 (B) 8/3 (C) 4 (D) 14/3 (E) 16/3

_____ 2. The region in the first quadrant between the *x*-axis and the graph of $y = 6x - x^2$ is rotated around the *y*-axis. The volume of the resulting solid of revolution is given by

(A) $\int_0^6 \pi\left(6x - x^2\right)^2 dx$ (B) $\int_0^6 2\pi x\left(6x - x^2\right) dx$ (C) $\int_0^6 \pi x\left(6x - x^2\right)^2 dx$

(D) $\int_0^6 \pi\left(3 + \sqrt{9 - y}\right)^2 dy$ (E) $\int_0^9 \pi\left(3 + \sqrt{9 - y}\right)^2 dy$

_____ 3. The base of a solid is the region enclosed by the graph of $y = e^{-x}$, the coordinate axes, and the line $x = 3$. If all plane cross sections perpendicular to the *x*-axis are equilateral triangles, then its volume is

(A) $\frac{\sqrt{3}\left(1 - e^{-6}\right)}{8}$ (B) $\frac{\sqrt{3}}{8}e^{-6}$ (C) $\frac{\sqrt{3}}{4}e^{-6}$ (D) $\frac{\sqrt{3}}{4}e^{-3}$ (E) $\frac{\sqrt{3}}{4}\left(1 - e^{-3}\right)$

_____ 4. What is the length of the arc of $y = \frac{2}{3}x^{3/2}$ from $x = 0$ to $x = 3$?

(A) 8/3 (B) 4 (C) 14/3 (D) 16/3 (E) 7

_____ 5. $\lim_{x \to 0} \frac{e^{2x} - 1}{\tan x} =$ (A) -1 (B) 0 (C) 1 (D) 2 (E) DNE

_____ 6. $\lim_{h \to 0} \frac{\int_{1}^{1+h} \sqrt{x^5 + 8}\,dx}{h} =$ (A) 0 (B) 1 (C) 3 (D) $2\sqrt{2}$ (E) DNE

_____ 7. $\lim_{x \to \infty} \left(1 + 5e^x\right)^{1/x} =$ (A) 0 (B) 1 (C) e (D) e^5 (E) DNE

_____ 8. $\int_2^{\infty} \frac{dx}{x^2} =$ (A) $\frac{1}{2}$ (B) $\ln 2$ (C) 1 (D) 2 (E) DNE

_____ 9. $\int_0^1 \frac{x+1}{x^2+2x-3}\,dx =$ (A) $-\ln\sqrt{3}$ (B) $-\frac{\ln\sqrt{3}}{2}$ (C) $\frac{1-\ln\sqrt{3}}{2}$ (D) $\ln\sqrt{3}$ (E) Diverges

II. Free Response: Show all work in the space provided.

10. Let f be the function given by $f(x) = kx^2 - x^3$, where k is a positive constant. Let R be the region in the first quadrant bounded by the graph of f and the x-axis.

(a) Find all values of the constant k for which the area of R equals 2.

(b) For $k > 0$, write, but do not evaluate, an integral expression **in terms of *k*** for the volume of the solid generated when R is rotated about the x-axis.

(c) For $k > 0$, write, but do not evaluate, and expression **in terms of *k***, involving one or more integrals that gives the perimeter of R.