BC Calculus
4-11 HW

Name: ____________________________
No Calculator for 1-11

1. $\int \sin(2x+3)\,dx =$

(A) $\frac{1}{2}\cos(2x+3)+C$ (B) $\cos(2x+3)+C$ (C) $-\cos(2x+3)+C$

(D) $-\frac{1}{2}\cos(2x+3)+C$ (E) $-\frac{1}{5}\cos(2x+3)+C$

2. $\int_0^8 \frac{dx}{\sqrt{1+x}} =$

(A) 1 (B) $\frac{3}{2}$ (C) 2 (D) 4 (E) 6

3. If $h(x)=f^2(x)-g^2(x)$, $f'(x)=-g(x)$, and $g'(x)=f(x)$, then $h'(x)=$

(A) 0 (B) 1 (C) $-4f(x)g(x)$

(D) $(-g(x))^2-(f(x))^2$ (E) $-2(-g(x)+f(x))$

4. If $F(x)=\int_0^x e^{-t^2}\,dt$, then $F'(x)=$

(A) $2xe^{-x^2}$ (B) $-2xe^{-x^2}$ (C) $\frac{e^{-x^2+1}}{-x^2+1}-e$

(D) $e^{-x^2}-1$ (E) $e^{-x^2}$

5. If the graph of $y=f(x)$ contains the point $(0, 2)$, $\frac{dy}{dx}=\frac{-x}{ye^{x^2}}$ and $f(x)>0$ for all $x$, then $f(x)=$

(A) $3+e^{-x^2}$ (B) $\sqrt{3}+e^{-x}$ (C) $1+e^{-x}$

(D) $\sqrt{3+e^{-x^2}}$ (E) $\sqrt{3+e^{x^2}}$

6. The average value of $f(x)=x^2\sqrt{x^3+1}$ on the closed interval $[0,2]$ is

(A) $\frac{26}{9}$ (B) $\frac{13}{3}$ (C) $\frac{26}{3}$ (D) 13 (E) 26

7. $\int_0^{\pi/4} \tan^2 x\,dx =$

(A) $\frac{\pi}{4}-1$ (B) $1-\frac{\pi}{4}$ (C) $\frac{1}{3}$ (D) $\sqrt{2}-1$ (E) $\frac{\pi}{4}+1$

8. The area of a circular region is increasing at a rate of $96\pi$ square meters per second. When the area of the region is $64\pi$ square meters, how fast, in meters per second, is the radius of the region increasing?

(A) 6 (B) 8 (C) 16 (D) $4\sqrt{3}$ (E) $12\sqrt{3}$

9.

| $x$ | 0 | 2 | 4 | 6 |
|---|---|---|---|---|
| $f(x)$ | 4 | $k$ | 8 | 12 |

The function $f$ is continuous on the closed interval $[0, 6]$ and has the values given in the table above. The trapezoidal approximation for $\int_0^6 f(x)\,dx$ found with 3 subintervals of equal length is 52. What is the value of $k$?

(A) 2 (B) 6 (C) 7 (D) 10 (E) 14

10. A region in the plane is bounded by the graph of $y=\frac{1}{x}$, the $x$-axis, the line $x=m$, and the line $x=2m$, $m>0$. The area of this region

(A) is independent of $m$.

(B) increases as $m$ increases.

(C) decreases as $m$ increases.

(D) decreases as $m$ increases when $m<\frac{1}{2}$; increases as $m$ increases when $m>\frac{1}{2}$.

(E) increases as $m$ increases when $m<\frac{1}{2}$; decreases as $m$ increases when $m>\frac{1}{2}$.

11. (No Calculator) Let $f$ be the function defined by $f(x)=xe^{1-x}$ for all real numbers $x$.

a) Find any intercepts.
b) Find $f'(x)$ and $f''(x)$.
c) Complete a sign chart for both $f'(x)$ and $f''(x)$ and then graph the function. Label the coordinates of any relative extrema or inflection points.
d) State the domain and range.

12. (Calculator) Consider the curve defined by $-8x^2+5xy+y^3=-149$.

(a) Find $\frac{dy}{dx}$.

(b) Write an equation for the line tangent to the curve at the point $(4,-1)$.

(c) There is a number $k$ so that the point $(4.2,k)$ is on the curve. Using the tangent line found in part (b), approximate the value of $k$.

(d) Write an equation that can be solved to find the actual value of $k$ so that the point $(4.2,k)$ is on the curve.

(e) Solve the equation found in part (d) for the value of $k$.

13. (Calculator) A particle moves along the $x$-axis so that its velocity $v$ at time $t$, for $0 \le t \le 5$, is given by $v(t)=\ln(t^2-3t+3)$. The particle is at position $x=8$ at time $t=0$.

(a) Find the acceleration of the particle at time $t=4$.

(b) Find all times $t$ in the open interval $0<t<5$ at which the particle changes direction. During which time intervals, for $0 \le t \le 5$, does the particle travel to the left?

(c) Find the position of the particle at time $t=2$.

(d) Find the average speed of the particle over the interval $0 \le t \le 2$.