Caluclus AB NAME: ____________

MC Packet 5 - Integration and FTC PERIOD: ______

In-Class Together: Problems 1-6

1. $\int_1^e \left(\frac{x^2-1}{x}\right) dx =$

(A) $e-\frac{1}{e}$ (B) e^2-e (C) $\frac{e^2}{2}-e+\frac{1}{2}$ (D) e^2-2 (E) $\frac{e^2}{2}-\frac{3}{2}$

2. Given $f(x)=\begin{cases} x+1 & \text{for } x<0, \\ \cos \pi x & \text{for } x \geq 0. \end{cases}$ $\int_{-1}^1 f(x)\,dx =$

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

3. $\int_0^3 |x-1|\,dx =$

(A) 0 (B) $\frac{3}{2}$ (C) 2 (D) $\frac{5}{2}$ (E) 6

4. $\int \frac{5}{1-x^2}\,dx =$

(A) $\frac{-10x}{\left(1+x^2\right)^2}+C$

(B) $\frac{5}{2x}\ln\left(1+x^2\right)+C$

(C) $5x-\frac{5}{x}+C$

(D) $5\arctan x+C$

(E) $5\ln\left(1+x^2\right)+C$

5. If $\int_0^k \left(2kx-x^2\right)dx=18$, then $k=$

(A) -9 (B) -3 (C) 3 (D) 9 (E) 18

6. If f is a continuous function and if $F'(x)=f(x)$ for all real numbers x, then $\int_1^3 f(2x)\,dx =$

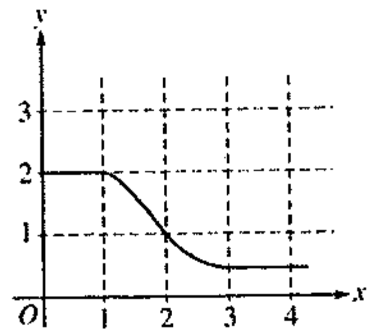
(A) $2F(3)-2F(1)$

(B) $\frac{1}{2}F(3)-\frac{1}{2}F(1)$

(C) $2F(6)-2F(2)$

(D) $F(6)-F(2)$

(E) $\frac{1}{2}F(6)-\frac{1}{2}F(2)$



7 The graph of f is shown in the figure above. If $\int_1^3 f(x)\,dx = 2.3$ and $F'(x) = f(x)$, then $F(3) - F(0) =$

(A) 0.3 (B) 1.3 (C) 3.3 (D) 4.3 (E) 5.3

8 $\int_1^2 x^{-3}\,dx =$

(A) $-\frac{7}{8}$ (B) $-\frac{3}{4}$ (C) $\frac{15}{64}$ (D) $\frac{3}{8}$ (E) $\frac{15}{16}$

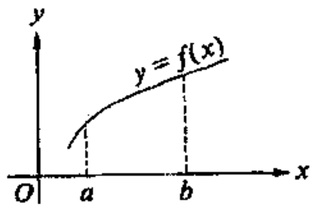
9 If the function f has a continuous derivative on $[0, c]$, then $\int_0^c f'(x)\,dx =$

(A) $f(c) - f(0)$ (B) $|f(c) - f(0)|$ (C) $f(c)$ (D) $f(x) + c$ (E) $f''(c) - f''(0)$

10 $\int \frac{x\,dx}{\sqrt{3x^2+5}} =$

(A) $\frac{1}{9}(3x^2+5)^{\frac{3}{2}} + C$ (B) $\frac{1}{4}(3x^2+5)^{\frac{3}{2}} + C$ (C) $\frac{1}{12}(3x^2+5)^{\frac{1}{2}} + C$

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



(11) If f is the continuous, strictly increasing function on the interval $a \le x \le b$ as shown above, which of the following must be true?

I. $\int_a^b f(x)\,dx < f(b)(b-a)$

II. $\int_a^b f(x)\,dx > f(a)(b-a)$

III. $\int_a^b f(x)\,dx = f(c)(b-a)$ for some number c such that $a < c < b$

(A) I only (B) II only (C) III only (D) I and III only (E) I, II, and III

---

(12) $\int \sec^2 x\,dx =$

(A) $\tan x + C$

(B) $\csc^2 x + C$

(C) $\cos^2 x + C$

(D) $\dfrac{\sec^3 x}{3} + C$

(E) $2\sec^2 x \tan x + C$

---

(13) If f is a linear function and $0 < a < b$, then $\int_a^b f''(x)\,dx =$

(A) 0 (B) 1 (C) $\dfrac{ab}{2}$ (D) $b-a$ (E) $\dfrac{b^2-a^2}{2}$

---

(14) $\int_0^8 \dfrac{dx}{\sqrt{1+x}} =$

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

15 Which of the following are antiderivatives of $f(x) = \sin x \cos x$?

I. $F(x) = \dfrac{\sin^2 x}{2}$

II. $F(x) = \dfrac{\cos^2 x}{2}$

III. $F(x) = \dfrac{-\cos(2x)}{4}$

(A) I only

(B) II only

(C) III only

(D) I and III only

(E) II and III only

---

16 For all $x > 1$, if $f(x) = \int_1^x \frac{1}{t}\,dt$, then $f'(x) =$

(A) 1 (B) $\frac{1}{x}$ (C) $\ln x - 1$ (D) $\ln x$ (E) e^x

---

17 What are all values of k for which $\int_{-3}^{k} x^2\,dx = 0$?

(A) -3 (B) 0 (C) 3 (D) -3 and 3 (E) -3, 0, and 3

---

18 Which of the following is equal to $\ln 4$?

(A) $\ln 3 + \ln 1$ (B) $\frac{\ln 8}{\ln 2}$ (C) $\int_1^4 e^t\,dt$ (D) $\int_1^4 \ln x\,dx$ (E) $\int_1^4 \frac{1}{t}\,dt$

(19) $\int_0^1 \sqrt{x^2-2x+1}\, dx$ is

(A) -1

(B) $-\frac{1}{2}$

(C) $\frac{1}{2}$

(D) 1

(E) none of the above

(20) $\int_0^{\frac{\pi}{4}} \frac{e^{\tan x}}{\cos^2 x} dx$ is

(A) 0 (B) 1 (C) $e-1$ (D) e (E) $e+1$

(21) If $\int_a^b f(x)\,dx = a+2b$, then $\int_a^b (f(x)+5)\,dx =$

(A) $a+2b+5$ (B) $5b-5a$ (C) $7b-4a$ (D) $7b-5a$ (E) $7b-6a$

(22) Let f be a continuous function on the closed interval $[0,2]$. If $2 \le f(x) \le 4$, then the greatest possible value of $\int_0^2 f(x)\,dx$ is

(A) 0 (B) 2 (C) 4 (D) 8 (E) 16

(23) If $\int_1^2 f(x-c)\,dx = 5$ where c is a constant, then $\int_{1-c}^{2-c} f(x)\,dx =$

(A) $5+c$ (B) 5 (C) $5-c$ (D) $c-5$ (E) -5

(24) $\int_0^1 (x+1)e^{x^2+2x}\,dx =$

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

(25) $\int_1^4 |x-3|\,dx =$

(A) $-\frac{3}{2}$ (B) $\frac{3}{2}$ (C) $\frac{5}{2}$ (D) $\frac{9}{2}$ (E) 5

(26) If $\int_{-1}^1 e^{-x^2}dx = k$, then $\int_{-1}^0 e^{-x^2}dx =$

(A) $-2k$ (B) $-k$ (C) $-\frac{k}{2}$ (D) $\frac{k}{2}$ (E) $2k$

(27) $\frac{d}{dx}\int_2^x \sqrt{1+t^2}\,dt =$

(A) $\frac{x}{\sqrt{1+x^2}}$ (B) $\sqrt{1+x^2}-5$ (C) $\sqrt{1+x^2}$

(D) $\frac{x}{\sqrt{1+x^2}}-\frac{1}{\sqrt{5}}$ (E) $\frac{1}{2\sqrt{1+x^2}}-\frac{1}{2\sqrt{5}}$

(28) $\int_1^2 \frac{x-4}{x^2}\,dx =$

(A) $-\frac{1}{2}$ (B) $\ln 2-2$ (C) $\ln 2$ (D) 2 (E) $\ln 2+2$

(29) $\int_0^1 (3x-2)^2\,dx =$

(A) $-\frac{7}{3}$ (B) $-\frac{7}{9}$ (C) $\frac{1}{9}$ (D) 1 (E) 3

(30) $\int_1^2 \frac{x+1}{x^2+2x}\,dx =$

(A) $\ln 8 - \ln 3$ (B) $\frac{\ln 8 - \ln 3}{2}$ (C) $\ln 8$ (D) $\frac{3\ln 2}{2}$ (E) $\frac{3\ln 2 + 2}{2}$

(31) If $\int_1^{10} f(x)\,dx = 4$ and $\int_{10}^{3} f(x)\,dx = 7$, then $\int_1^3 f(x)\,dx =$

(A) -3 (B) 0 (C) 3 (D) 10 (E) 11

(32) $\int_0^{\sqrt{3}} \frac{dx}{\sqrt{4-x^2}} =$

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

(33) $\frac{d}{dx}\int_0^x \cos(2\pi u)\,du$ is

(A) 0 (B) $\frac{1}{2\pi}\sin x$ (C) $\frac{1}{2\pi}\cos(2\pi x)$ (D) $\cos(2\pi x)$ (E) $2\pi\cos(2\pi x)$