Collcute High School

1.	Which	of the	following	is	equal	to	e?
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I.
$$\sum_{n=1}^{\infty} \frac{1}{n!}$$

I.
$$\sum_{r=1}^{\infty} \frac{1}{n!}$$
 II. 2.718281828 III $\lim_{x \to \infty} (\cos x + x)^{\frac{1}{x}}$

A) I

B) II

C) III

D) I and II

E) I, II, and III

2. What is the *nth* derivative, $f^{[n]}(x)$, of the function $y = x^n$?

B) n^2 C) (n-1)! D) n! E) NOTA

3. If $y = x^4 + 2x^3 + 3x^2$, then the derivative of y with respect to $x^2 + 1$ is

A)
$$4x + 3$$

B) $2x^2 + 6x + 3$ C) $2x^2 + 3x + 3$

D)
$$4x^3 + 2x^2 + 6x$$

E) NOTA

4. The graph of $f(x) = \frac{2x^2 - x - 3}{3x^2 - x - 2}$ crosses its horizontal asymptote when

A)
$$x = 5$$

B) x = 1 C) x = -1 D) x = -5 E) NOTA

5. The number of bacteria in a culture is growing at a rate of $1500e^{5t/3}$ per unit of time. At t = 0, the number of bacteria present was 2500. The number of bacteria present at t = 6 is

- A) $2500e^6$
- B) $1500e^{10}$ C) $2500e^{10}$ D) $900e^{10}$ E) NOTA

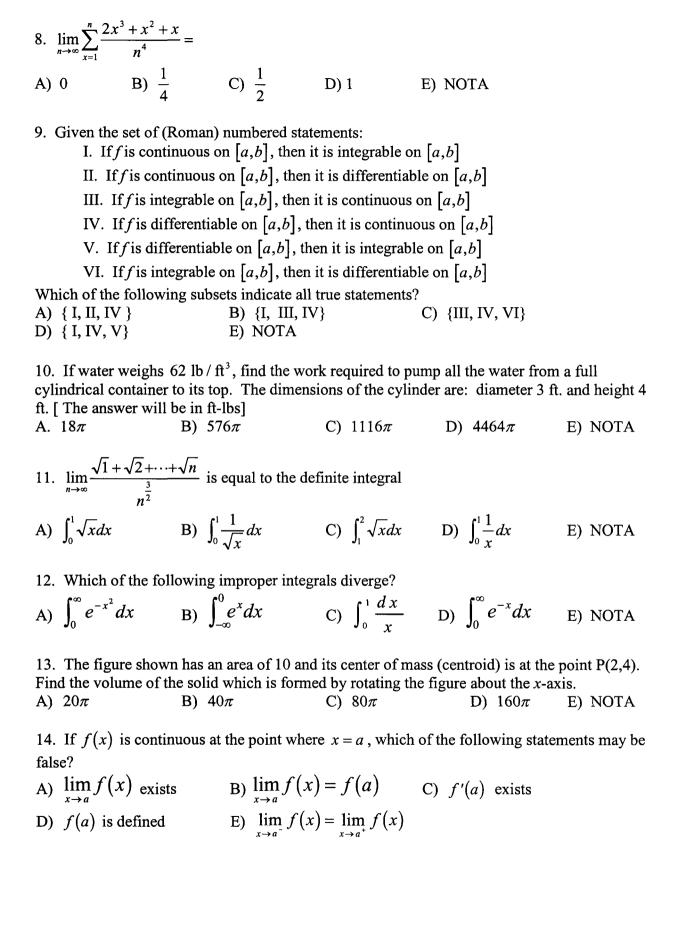
6. Choose (a, b) such that $0 \le a \le \pi$ and $0 \le b \le 1$. What is the probability that (a,b) lies outside the region defined by $\int_0^{\pi} \sin x dx$?

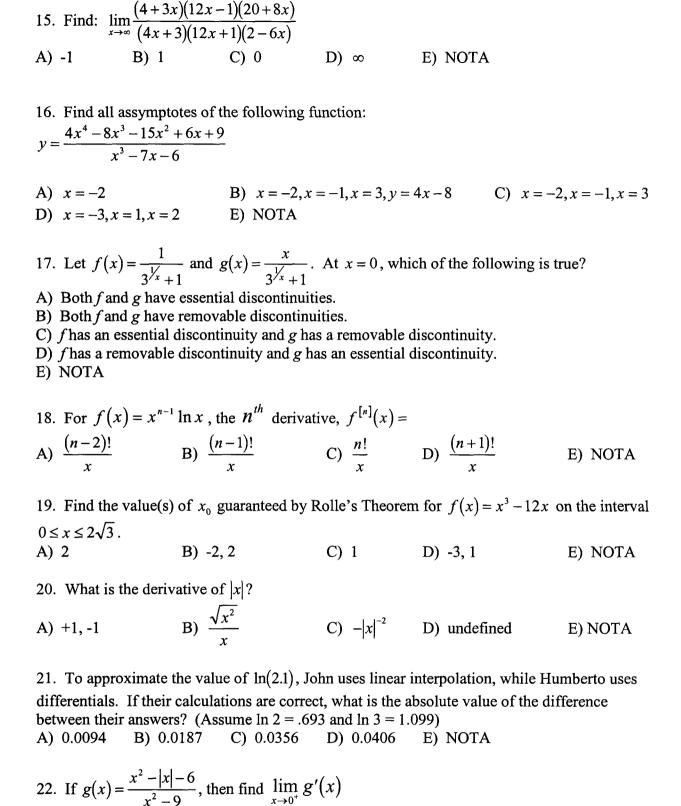
A)
$$\frac{1}{2}$$

A) $\frac{1}{2}$ B) $\frac{\pi - 2}{\pi}$ C) $\frac{\pi - 2}{\pi^2}$ D) $\frac{\pi^2 - 2}{\pi}$ E) NOTA

7. $\lim_{n\to\infty} \left(\sqrt{n^2+n} - \sqrt{n^2+1}\right)$

A) 0 B) $\frac{1}{4}$ C) $\frac{1}{2}$ D) ∞ E) NOTA





C) 1/3 D) 2/3

E) NOTA

A) 1/9

B) 1/6

thro	ught the po	oint	$\left(0,\frac{\pi}{3}\right)$.						
A)	$y = \frac{2\sqrt{3}}{3}x$	$+\frac{\pi}{3}$		В)	$y = \frac{2\sqrt{3}}{3}x$	$-\frac{\pi}{3}$		C) <i>y</i>	$=\frac{1}{2}x+\frac{\pi}{3}$
D)	$y = \frac{1}{2}x - \frac{\pi}{3}$	•		E)	NOTA				
									$-\frac{\pi}{4}$, $b=\frac{\pi}{4}$.
A)	0	B)	1	C)	$-\frac{\pi}{4}$	D)	$\frac{\pi}{4}$	E) N	IOTA
27. Find the curvature of $y^2 = 2x$ when $x = 2$.									
A)	$\frac{\sqrt{5}}{25}$	B)	$\sqrt{5}$	C)	$\frac{\sqrt{5}}{5}$	D)	5√5	E) N	IOTA
28. A hotel chain has asked the R&R Railroad Company to run a special train to accomodate its customers. The railroad company agrees if at least 200 people will use the service. The fare is to be \$8 per person if 200 go and will decrease by one cent for everybody for each person over 200 that goes. If k is the number of passengers that will give the raidroad maximum revenue, find $2k-200$.									
A)	230	B)	400	C)	640	D)	800	E) N	NOTA
29. Two cars leave an intersection at the same time, one heading 30° from due north and 50 mph and the other heading 90° from due north at 40 mph. After one hour, how fast is the distance between the two cars changing?									
A)	5√21	B)	$10\sqrt{21}$	C)	$\frac{41\sqrt{21}}{21}$	D)	$\frac{30\sqrt{21}}{7}$	E) N	NOTA
30	$\lim_{r\to 0}\frac{1}{2}r^{-1}\Big(\Big($	$r + \epsilon$	$(e)^{r+e}-e^e$						
A)	e	B)	$\frac{1}{2}e^{e}$	C)	e^e		D) 2	e^e	E) NOTA

23. Calculate $\int_{1}^{3} x^{2} dx$ using the trapezoid rule with 6 subdivisions of the interval [1,3].

24. What is the coefficient of x^2 in the Maclaurin series of $f(x) = \frac{1}{\sqrt{1 + \sin 2x}}$?

C) 461/54

C) 2

A) 26/3

A) 6

B) 235/27

B) 3

D) 13/2

D) 1

25. Find the equation of the line tangent to the curve $e^x + \cos(y) - \frac{3}{2} = 0$, if the line passes

E) NOTA

E) NOTA

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1. C (I = e - 1, II \text{ not exact!}, III = e)
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- 2. D
- 3. C
- 4. D

5. E
$$900e^{5t/3} + 1600$$

- 6. E
- 7. C
- 8. C
- 9. D
- 10. C
- 11. A
- 12. C
- 13. C
- 14. C
- 14. C
- 16. E (x=3, x=-1 are removable so not assymptotes. x=-2 vertical, y=4x-8, oblique)
- 17. C
- 18. B
- 19. A
- 20. B
- 21. A
- 22. A
- 23. B
- 24. E $\frac{3}{2}$
- 25. A
- 26. E MVT does NOT apply because function is not continuous.

27. A
$$\frac{|y''|}{(1+(y')^2)^{\frac{3}{2}}}$$

- 28. D
- 29. B
- 30. C