1. accept A, B, C, D
2. A
3. C
4. D
5. A
6. B
7. D
8. A
9. E, (2k)
10. A
11. C
12. B
13. C
14. D
15. C
16. C
17. B
18. A
19. B
20. D
21. D
22. E
23. E
24. D
25. A
26. C
27. A
28. B
29. A
30. D

1. **D,** $\int_1^{e^{.5}} \frac{dt}{t} = .5$, which is equivalent to each of the answers.
2. **A,** for b, the expression is the average value of g(t), and c is not necessarily true if G(x)<0 for any *x* on the interval.
3. **C,**
$$\frac{dy}{y} = 3dx \rightarrow ln\, y = 3x + C \rightarrow y = Ke^{3x}$$
$$1 = Ke^3 \rightarrow K = e^{-3} \rightarrow y(2) = e^{-3} \cdot e^6 = e^3$$
4. **D,** $\int_0^1 \frac{8x+4}{1+x^2}dx = 4Arc\tan x + 4ln\left(1+x^2\right)\Big|_0^1 = \pi + 4ln\,2 = ln\left(16e^{\pi}\right)$.

5. **A,** calculation, we see:
$$\int_{exact} = 125 - 1 = 124.$$
$$\int_{approx.} = 3 \cdot \frac{4}{8}\left(1 + 2\cdot 4 + 2\cdot 9 + 2\cdot 16 + 25\right) = 126.$$
$$E = approx - exact = 2.$$

6. **B,** $f(t) = t^2;\ f(.5) = .25$.

7. **D,**
$$f(t) = t^2;\ f'(t) = 2t$$
$$Area = \int_0^2 \left(2t - t^2\right)dt = \frac{4}{3}.$$

8. **A,** Becca's volume is $\int_D \left(f(x)\right)^2 dx$ while Skiya's volume is $2\left(\frac{\sqrt{3}}{4}\int_D \left(f(x)\right)^2 dx\right) = \frac{\sqrt{3}}{2}\int_D \left(f(x)\right)^2 dx$. Clearly, $\int_D \left(f(x)\right)^2 dx = \frac{\sqrt{3}}{2}\int_D \left(f(x)\right)^2 dx$.
9. **E,** Since each 'hump' of the sinx curve has area 2, and the absolute value of sinx from 0 to $k\pi$ will have *k* 'humps,' then the area must be 2*k.*
10. **A,** T is the quarter-circle $(a-1)^2 + (b-1)^2 = 2c$, where $a < 1$ and $b > 1$. The length is $\frac{2\pi R}{4} = \frac{\pi\sqrt{2c}}{2}$.
11. **C,** $ln\left(sin\,2x + 1\right) - ln\left(cos\,2x\right) = ln\left|sec\,2x + tan\,2x\right|;\ \frac{d\left(ln\left|sec\,2x + tan\,2x\right|\right)}{dx} = 2\,sec\,2x$.
12. **B,** definition of washer's method.

13. C, $2\pi\int_1^2\left(32-2x^4\right)dx=\frac{196}{5}\pi$.

14. D, $\frac{dy}{dx}=\frac{kx}{y}\rightarrow .5y^2=.5kx^2+C.\rightarrow k<0=circle/ellipse$
$k>0=hyperbola\rightarrow NMI$

15. C, $\int f'(g(2x))dx=f(g(2x))+C\rightarrow 2g'(2x)=1\rightarrow$
$g(2x)=x+C;g(2x)=x+8;g(4)=2+8=10$

16. C, $\int_1^2 x\sqrt{x-1}=2\int_0^1\left(u^4+u^2\right)du=\frac{16}{15}$.

17. B, $y=cos\left(sin^{-1}\left(cos\left(sin^{-1}\left(cos(...)\right)\right)\right)\right)$ $\rightarrow y=cos\left(sin^{-1}y\right)=\sqrt{1-y^2}\rightarrow y=\frac{1}{\sqrt{2}}$
$A=\frac{1}{\sqrt{2}}\left(\sqrt{2}-0\right)=1$

18. A, it is necessary but not sufficient.

19. B, $\frac{f\left(\frac{\pi}{4}\right)-f\left(\frac{-\pi}{4}\right)}{\frac{\pi}{2}}=0=f'(c)=0\rightarrow p(c)=0$

20. D, $\int_0^{.25\pi}tan\theta\cos\theta d\theta=\int_0^{.25\pi}sin\theta d\theta=1-\frac{\sqrt{2}}{2}$

21. D, $\lim_{n\rightarrow\infty}g(n)=\sum_{k=2}^{\infty}\frac{ln\,k}{k}$. Use integral test for convergence; the integral and therefore the limit does not exist.

22. B,

$f(n)=\int_0^2 x^{\frac{n(n+1)}{2}}dx=\left.\frac{x^{.5n^2+.5n+1}}{.5n^2+.5n+1}\right|_0^2=\frac{2^{.5n^2+.5n+1}}{.5n^2+.5n+1}$

$f(100)=\frac{2^{5051}}{5051},f(99)=\frac{2^{5050}}{5050};\frac{f(100)}{f(99)}=\frac{10100}{5051}$

23. B, $f(n)=g(n)\rightarrow\frac{f(100)}{g(99)}=\frac{f(100)}{f(99)}=\frac{10100}{5051}$.

24. D,

$$A(t)=\frac{\int_0^{2t} v(x)dx}{t^2}\rightarrow \lim_{t\to 0}\frac{2v(2t)}{2t};v(0)=0$$

$$\rightarrow \lim_{t\to 0}\frac{2v'(2t)}{1}=2v'(0)=2a(0)$$

25. A,

$$\int e^x \ln x dx; u=e^x, du=e^x dx, dv=\ln x dx,$$

$$v=x\ln x-x\rightarrow \int e^x \ln x dx=e^x(x\ln x-x)-$$

$$\int e^x x\ln x dx+\int xe^x dx\rightarrow \int e^x \ln x(x+1)dx=$$

$$e^x(x\ln x-x)+xe^x-e^x=e^x(x\ln x-1)\Big|_1^e=$$

$$e^e(e-1)+e$$

26. C, $x=\frac{k}{n}; width=\frac{1}{n}\rightarrow \frac{1}{\ln b}\int_0^3 b^x \ln b dx=\frac{b^3-1}{\ln b}$.

27. E, The absolute value curves form a square of area 16. The smaller region is bounded by $y=2-x, y=2,$ and $x=2$. This has area of 2 (by simple geometry). Then the area of the big region is 16 – 2 = 14.

28. B, if the axis of rotation is a side of the rectangle, a cylinder will be formed. Otherwise, a cylinder is not necessarily formed.

29. A,

$$f'(x)=\cosh x; g'(x)=\sinh x;$$

$$f'^2-g'^2=1=y\rightarrow line$$

30. D, $f(T)=Arc\tan(\sin T)$, which is represented in the diagram by *d*.