1 A $f(x)=2x^3+\sqrt{\pi x}+\sin x+\pi^\pi$

$6x^2+\frac{1}{2}(\pi x)^{-\frac{1}{2}}\pi+\cos x$

$6\pi^2+\frac{1}{2}(\pi\pi)^{-\frac{1}{2}}\pi+\cos\pi=6\pi^2+\frac{1}{2\pi}-1=\frac{12\pi^3-2\pi+1}{2\pi}$

2 B Since *f* is a polynomial it is continuous and differentiable. f'(-2) =0 means that it is a critical point. f"(-2)=3 > 0 means concave up. so local minimum.
f'(-3)=

3 A $\lim\limits_{x\to\infty}\frac{\sqrt{4x^2-1}}{x^2}=\lim\limits_{x\to\infty}\frac{\frac{1}{x}}{\frac{1}{x}}\frac{\sqrt{4x^2-1}}{x^2}=\lim\limits_{x\to\infty}\frac{\sqrt{\frac{4x^2}{x^2}-\frac{1}{x^2}}}{\frac{x^2}{x}}=\lim\limits_{x\to\infty}\frac{\sqrt{4-\frac{1}{x^2}}}{x}=\frac{2}{\infty}=0$

4 B $\lim\limits_{x\to\infty}\sum_{n=1}^{x}e^{\frac{1}{n}}\cdot\frac{1}{n}=\int_0^1 e^x dx=e^x-1\Big|_0^1=e-1$ B) $e-1$

5 E $\frac{1}{2}\cdot\int_0^\pi[\sin x]dx$ Since sin x only reaches the value of 1 at $\frac{\pi}{2}$, the function reduces to 0 for all other points. Integral is 0 E) NOTA

6 E $\cos^2 x+\sin^2 x=1$ The derivative of a constant is 0

7 D The function is a quarter circle with radius 4 $\frac{16\pi}{4}=4\pi$

8 D $\left(x^{\frac{2}{3}}+y^{\frac{2}{3}}\right)^{\frac{3}{2}}=\left(\left(\frac{27}{8}\right)^{\frac{2}{3}}+(8)^{\frac{2}{3}}\right)^{\frac{3}{2}}=\frac{125}{8}$

9 E The limit does not exist at 0, since the function does not exist for negative x

10 A $\lim\limits_{x\to\infty}\sqrt{Ax^2+Bx}-x\cdot\frac{\sqrt{Ax^2+Bx}+x}{\sqrt{Ax^2+Bx}+x}=2$

$\lim\limits_{x\to\infty}\frac{Ax^2+Bx-x^2}{\sqrt{Ax^2+Bx}+x}=2$ normally, Ax^2-x^2 would dominate and the limit would be infinity. Since the limit is 2, $Ax^2-x^2=0\to A=1$

$\lim\limits_{x\to\infty}\frac{Bx}{\sqrt{x^2+Bx}+x}=2$ means B=2 Thus $A^2+B^2=1+4=5$

11 D this is the definition of the derivative of e^x evaluated at x=1. D) e

12 B Function is an odd function and is thus symmetric through the origin. The integral is 0

13 A vertical translations do not effect the value of ∂, so just consider the function 2x. ∂ must be less than $\frac{\in}{|2|}$=.05 so .04

14 E slope of tangent line is $\frac{1}{1+x^2}=\frac{1}{1+\left(\frac{\pi}{2}\right)^2}=\frac{1}{\frac{4+\pi^2}{4}}=\frac{4}{4+\pi^2}$ Normal is $-\frac{4+\pi^2}{4}$

15 A $$\int_{0.0\overline{135}}^{0.\overline{027}} dx=\int_{\frac{1}{74}}^{\frac{1}{37}} dx=\frac{1}{37}-\frac{1}{74}=\frac{1}{74}$$

16 E function has singularity at 0. No real number answer E

17 A The apparent answer $\frac{1}{2}\ln\left(\ln x^2\right)+C$ does not appear, so it is tempting to choose E without further consideration. In fact, answer A differs by the apparent answer by a constant.

$$\frac{1}{2}\ln\left(\ln x^2\right)+C=\frac{1}{2}\left[\ln\left(2\ln x\right)\right]+C=\frac{1}{2}\ln 2+\frac{1}{2}\ln\left(\ln x\right)+C=\frac{1}{2}\ln\left(\ln x\right)+\left(C+\frac{1}{2}\ln 2\right)$$

18 B In general if $F(x)=\int_a^{g(x)} f(t)\,dt$ then $F'(x)=f\left(g(x)\right)g'(x)$. Since

$g(x)=x^2-2x+8$

$g'(x)=2x-2$

$g'(-1)=0$

so the answer is 0

19 D Let a be an irrational number in I, and let $\in>0$ be given.Then, in an open interval centered at *a* and contained within I, ther are less than 1+2+…+(q-1)=q(q-1)/2 positive rational numbers less than 1 and of the form m/n, where m and n are positive integers and n is less than q. From this finite list of rational numbers, choose the one, r, that is closest to *a* and let $\delta=|r-a|$. Then, within the open interval (a-r, a+r), the value of f(x) will be less than 1/q, so f(x) will be less than $\in$. *f* is continuous at every irrational

20 D If the value of f(x) changes sign between *a* and *b*, then there is a zero between *a* and *b*.

21 B C is the actual answer using a calculator, but we need the value of the approximation so y=e^x → y' = e^x dy = y'(0) * dx + e^0 → 1*.1 + 1 = 1.1

22 D $x+y=12\rightarrow y=12-x$

$M=x^2y\rightarrow M=x^2\left(12-x\right)=12x^2-x^3$

$M'=24x-3x^2\rightarrow x=0,8$

Check 0, 8, and 12 → 0, 256, 0 Answer is 256 D

23 D The regular partition will divide [0,2] into 4 intervals of length 1/2 at 0, 1/2, 1, and 3/2. The heights (x^2+1) will be 1, 5/4, 2, 13/4. so the area is 1/2(1+5/4+2+13/4) = (1/2)(30/4) = 15/4

24 A $\lim_{x\to 0}\frac{10^x-1}{x}$ looks like the definition of derivative for $y=10^x$ when x = 0. (use *h* for *x* in the problem $\lim_{h\to 0}\frac{10^{(0+h)}-10^0}{h}$

25 B The integrand goes to infinity when x=1 so it is necessary to use improper integrals

$$\lim_{N\to 1}\int_0^N \frac{xdx}{(x^2-1)^{\frac{2}{3}}}+\int_N^3 \frac{xdx}{(x^2-1)^{\frac{2}{3}}}=\lim_{N\to 1^-}\left[\frac{3}{2}(x^2-1)^{\frac{1}{3}}\right]_0^N+\lim_{N\to 1^+}\left[\frac{3}{2}(x^2-1)^{\frac{1}{3}}\right]_N^3=\frac{3}{2}+3=\frac{9}{2}$$

26 C The $\lim_{x\to n^-}[x]=n-1, \lim_{x\to n}|x|=n$ so

$\lim_{x\to -n^-}(|x|-[x])-\lim_{x\to n^-}(|x|-[x])$ = n – (-(n-1)) – n – (n-1) = 2n+1-2n+1=2

27 D Solve for y: $y=\frac{2x^2+3x-6}{2x+1}\to y=x+1+\frac{-7}{2x+1}$

The first form is undefined when x= -1/2

The limit as x→ infinity in the second form is y= x+1

28 A f(1) = 1+1+-3 = -1

f'(1) = 2x+1 = 3

mx + b = -1

m = 3

so 3*1+b=-1 b = -4

29 D there is a point c, where the f'(c) is equal to the slope of the secant line from a,f(a) to b,f(b) $f'(c)=\frac{f(b)-f(a)}{b-a}\to(b-a)f'(c)=3-1=2$

30 A $A=\pi r^2 \quad \frac{dA}{dt}=2\pi r\frac{dr}{dt}=2\pi 4\frac{1}{2}=4\pi$