1) $57+\frac{\sqrt{3}}{6}$

A= $\frac{\sqrt{3}}{6}$, factor out $\sqrt{x}-\sqrt{3}$ from top and bottom and plug in x=3
B= 56, dividing by x-1 leaves (x-8)(x-9) on top and plug in x=1
C= 2, just plug in x value
D= 1, multiply top and bottom by $\sqrt{x^2+2x}+x$ and take the limit as x goes to infinity

2) 7419

A= 11, f ‘(x)= 2x+7, then plug in x=2
B= 36, g ‘‘(x)= 6x, then plug in x=6
C= 5324, derivative of f(g(x))= f ‘(g(x))(g ’(x)) which is (2(x^3-4x+9)+7)($3x^2-4$), then plug in x=4
D= 2048, the second derivative is $30x^4-96x^2+150x+32$, then plug in x=3

3) $9\pi-1$

f ’(x)= $\frac{x(3^x\pi\sec^2(\pi x)+3^x\ln(3)\tan(\pi x))-3^x\tan(\pi x)}{x^2}$ and f ‘(3)= $\frac{3(27\pi)}{9}$= 9π
g ‘(x)= $sec^2(x)$ because g(x) is just tan(x), so g '(0)=1

4) $62+\frac{2\sqrt{33}}{3}$

A= **6**, acceleration is 6t-24, then plug in t=5
B= **-32**, at t=0, s(0)= -3 and at t=2, s(2)= 8-48+8-3= -35. So displacement is -35-(-3)=-32
C= **-28**, average rate of change is $\frac{s(4)-s(0)}{4-0}$ which is $\frac{-115-(-3)}{4}$
D= $\mathbf{4}-\frac{2\sqrt{33}}{3}$ velocity equals $3t^2-24t+4$, then obtain the smaller root via quadratic formula

5) 220

A= 286, right hand Riemann sum is 2(23+45+75)
B= 154, left hand Riemann sum is 2(9+23+45)
C= 220, trapezoidal rule is 1(9+2(23)+2(45)+75)

6) $(1,3)$

Every point on the graph of the given function can be expressed as (x, x^2+2). So, the distance to the point (5,1) can be expressed as $\sqrt{(x-5)^2+(x^2+1)^2} = \sqrt{x^4+3x^2-10x+26}$. To minimize the distance, we must set its derivative equal to 0. The derivative of the distance formula is $\frac{4x^3+6x-10}{2\sqrt{x^4+3x^2-10x+26}}$. So, setting the numerator equal to 0, the only real root we get is x=1, so the point on the graph closest to (5,1) is $(1, 1^2+2)$= (1,3)

7) 3456

B= 2, set $\frac{2y-(-3)}{4}$ equal to 2x+4, solve for x
A= 36, this is simply 11+9+7+5+3+1
R= $\frac{1}{2}$, take the derivative to get $3x^2-\frac{3x}{2}$ and solve for x to get $\frac{1}{2}$ and 0, plug in these two and other endpoint to see which is the minimum
Y= 192, 8 minutes after flying 240 mph, the plane has traveled 32 miles, so the distance between the person and the plane is $\sqrt{24^2+32^2}$=40 so $x^2+y^2=z^2$ and take the derivative to get xdx+ydy=zdz and dx equal 0 so 40dz=(32)(240)

8) $\frac{3\pi}{2}+\frac{7}{4}$

A= 1, derivative is just tan(x) and at x= $\frac{\pi}{4}$, the slope is just 1
B= $\frac{3\pi}{2}$, this is just one quarter of the area of the ellipse $4y^2+9x^2=36$
C= 1, take the derivative, giving 2x-2, and set equal to zero
D= -$\frac{1}{4}$, taking the derivative twice and solving for solutions yields no solutions between 4 and 6, so just plug in endpoints to slope

9) 217

A= 10, the answer is infinite
B= 10, the answer is infinite
C= 169, derivative is $18x^2+7$, then plug in x=3
D= 28, integrate from 0 to 3 and divide by three

10) 35

A is FALSE because the limit taken from the right side is 2, not 4
B is FALSE because the limit taken from the left side is 4, not 2
C is FALSE because at x=3, f ’(x) is defined and is -1
D is TRUE because at x=1 the limit from the left does not match that of the limit from the right, so the function is not continuous at x=1

11) -12.5

A= $\frac{3}{4}$, the derivative is $\frac{-g'(x)}{[g(x)]^2}$, then plug in the values of g(1) and g'(1)
B= 0, the derivative is f '(g(x))g'(x), the plug in the values for x=2 for g(x), which is 3, and f '(3) is 0
C= -10, the derivative is f '(x)g(x)+g'(x)f(x), the plug in the values at x=3
D= $\frac{-13}{4}$, the derivative is $\frac{g'(x)f(x)-f'(x)g(x)}{f(x)^2}$, then plug in the values at x=0

12) $1+\frac{\pi}{4}$

The function inside the integral is the derivative of $\tan^{-1} t$. So, integrating this derivative from 0 to tan(x) gives us $\tan^{-1}\tan(x)$, which, from $\frac{-\pi}{2} < x < \frac{\pi}{2}$, is x, F($\frac{\pi}{4}$) is just $\frac{\pi}{4}$, and F '($\frac{\pi}{4}$) according to the second fundamental theorem of calculus is $\frac{\sec^2(\frac{\pi}{4})}{1+\tan^2(\frac{\pi}{4})}$= 1

13) $2^{2012}\sin(2x)$

the n[th] derivative of sin(2x) will have a leading coefficient of 2^n and since n is divisible by 4, then the function following the coefficient will be sin(2x)

14) $\frac{8\sqrt{3}}{9}$

the diagonal of the cube is 2r, which is 2, and the diagonal is s$\sqrt{3}$ so s=$\sqrt{\frac{4}{3}}$ and V=s^3 which is $\frac{8\sqrt{3}}{9}$

15) 2

the derivative of an odd function is an even function, so f '(1)=f '(-1)