14. $f(x) = x^3 - x - 6$

Inverse: $f(y) = x$

Inverse

$y = x$ (switch)

$f(x) = y$

$f(g(x)) = x$

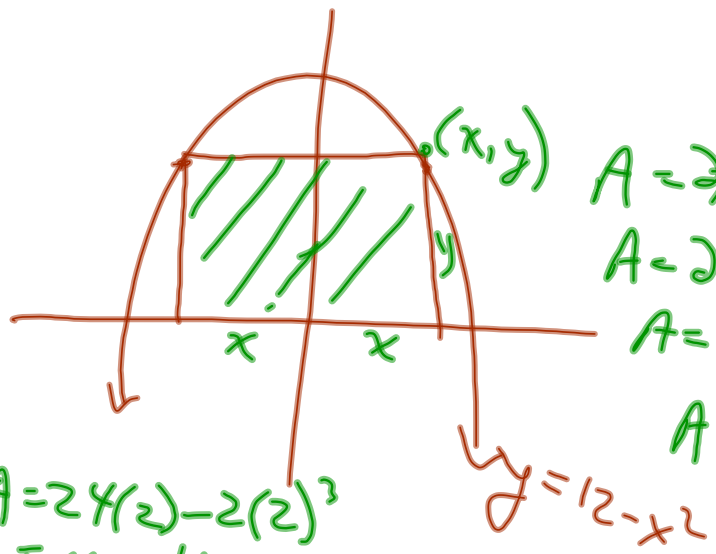
y

$f'(g(x)) = 1$

$f'(g(x))\, g'(x)$

$\underbrace{f'(g(0))\, g'(0)}_{=(1)}$

16.



$A = 2xy$

$A = 2x(12 - x^2)$

$A = 24x - 2x^3$

$A' = 24 - 6x^2$

$0 = 24 - 6x^2$

$6x^2 = 24$

$x^2 = 4$

$x = \pm 2$

$A = 24(2) - 2(2)^3$

$= 48 - 16$

$= \underline{32u^2}$

19. $\frac{d}{dx}\int_0^{2x}(e^t+2t)\,dt$

$=\left[e^{2x}+2(2x)\right](2)$

$=2e^{2x}+8x$

11. $y^2 - 2xy = 21$ $(2, -3)$

20.

21. $f'(x) = 3x^2$

$f(-1) = 2$

$f(x) = x^3 + C$

$2 = (-1)^3 + C$

$3 = C$

$$\int_0^2 f(x)\,dx$$

$$\int_0^2 (x^3 + 3)\,dx$$

$$= \frac{x^4}{4} + 3x \Big|_0^2$$

$$= (4 + 6) - (0)$$

$$= \underline{10}$$

18. $f(x) = \underbrace{e^x}\,\underbrace{\ln x}$ $\quad f'(e)$

$$f'(x) = e^x \ln x + e^x \frac{1}{x}$$

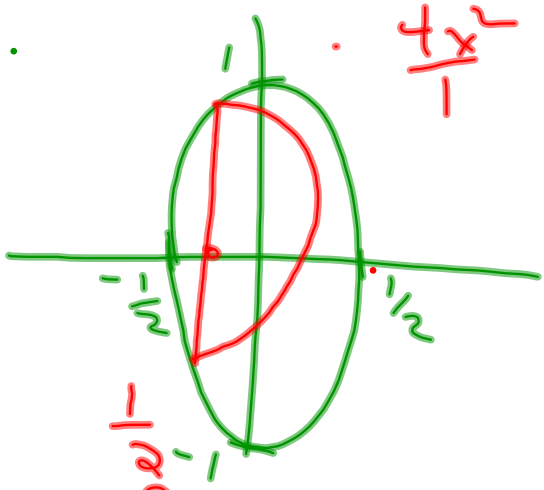
$$f'(e) = e^e \ln e + e^e \frac{1}{e}$$

$$= e^e + \frac{e^e}{e^1}$$

exponent laws

$$= e^e + e^{e-1}$$

22.



$\frac{4x^2}{1}$

$4x^2+y^2=1$

$\frac{x^2}{\left(\frac{1}{4}\right)}+\frac{y^2}{1}=1$

$a^2=\frac{1}{4}$ $\quad$ $b^2=1$

$a=\frac{1}{2}$ $\quad$ $b=1$

$y=\sqrt{1-4x^2}$

$$V=\pi\left(\frac{1}{2}\right)\int_0^{1/2}\left(\sqrt{1-4x^2}\right)^2dx$$

$$V=\pi\int_0^{1/2}\left(1-4x^2\right)dx$$

$$=\pi\left(x-\frac{4}{3}x^3\right)\Big|_0^{1/2}$$

$$=\pi\left(\frac{1}{2}-\frac{4}{3}\left(\frac{1}{8}\right)\right)-(0)$$

$$=\pi\left(\frac{3}{6}-\frac{1}{6}\right)$$

$$=\frac{\pi}{3}$$

12. $\frac{1}{3}\frac{1}{9}\int_0^9 \sqrt{3x}\,(3)\,dx$

$= \frac{1}{27}\left(\frac{2}{3}(3x)^{3/2}\right)\Big|_0^9$

$= \frac{2}{81}(3x)^{3/2}\Big|_0^9$

$= \frac{2}{81}\left[27^{3/2} - 0\right]$

$= \frac{2}{81}\left(\sqrt{27}\right)^3$

$= \frac{2(3\sqrt{3})^3}{81}$

$= \frac{2}{3}(\sqrt{3})^3$

$= \frac{6\sqrt{3}}{3} = 2\sqrt{3}$