Q6 (a) 2016

$$f(t) = \ln(2t) + 1$$

$$f^{-1}(t) = \frac{1}{2}e^{t-1}$$

An antiderivative of $f^{-1}(t)$ is

$$\frac{1}{2}e^{t-1}$$

$$g(t) = \sqrt{\frac{1}{4}t + 1}$$

$$g^{-1}(t) = 4(t^2 - 1)$$

An antiderivative of $g^{-1}(t)$ is

$$4\left(\frac{t^3}{3} - t\right) .$$

Q6 (b)

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$$y = A e^{kt}$$

$$1000 = y(0) = A e^{k \cdot 0} = A$$

$$\boxed{y = 1000 e^{kt}}$$

Do not write in red pen on my exam.

$$2000 = y(1) = 1000 e^{k}$$

$$2 = e^{k}$$

Need to find $y(4)$.

$$y(4) = 1000 e^{4k}$$
$$= 1000 (e^{k})^{4}$$
$$= 1000 (2)^{4}$$
$$= \underline{16\,000} \text{ ants.}$$

↑ answer

Exam Hints

There is a rate of change problem on the exam.

Q6 (h)

$$a\frac{df}{dx} - 5f = 0$$

$$a\frac{df}{dx} = 5f$$

$$\frac{a}{f}\frac{df}{dx} = 5 \quad \text{separable}$$

$$\int \frac{a}{f}\,df = \int 5\,dx$$

$$\boxed{a\ln(f) = 5x + c}$$

$f(0) = 2$ when $x = 0$

$$\boxed{a\ln(2) = c} \quad (1)$$

$$af'(x) - 5f(x) = 0$$

when $x = 0$

$$a\,10 - 5.2 = 0 \qquad (2)$$

(2) − (1)

$$10a - 10 - a\ln(2) = 0$$

$$a(10 - \ln(2)) = 10$$

$$a = \frac{10}{10 - \ln(2)}$$

$$a = \frac{10}{10}$$

$$a = 1$$ answer