

# Final Exam

Session 102

1a)  $f'(n) = 3n^2 e^n + n^3 e^n \checkmark$

1b) (1)  $2 \cos(2n)$  (2)  $4 \sin(2n)$  (3)  $-8 \cos(2n)$

(4)  $16 \sin(2n)$  (5)  $32 \cos(2n)$  (6)  $-64 \sin(2n)$

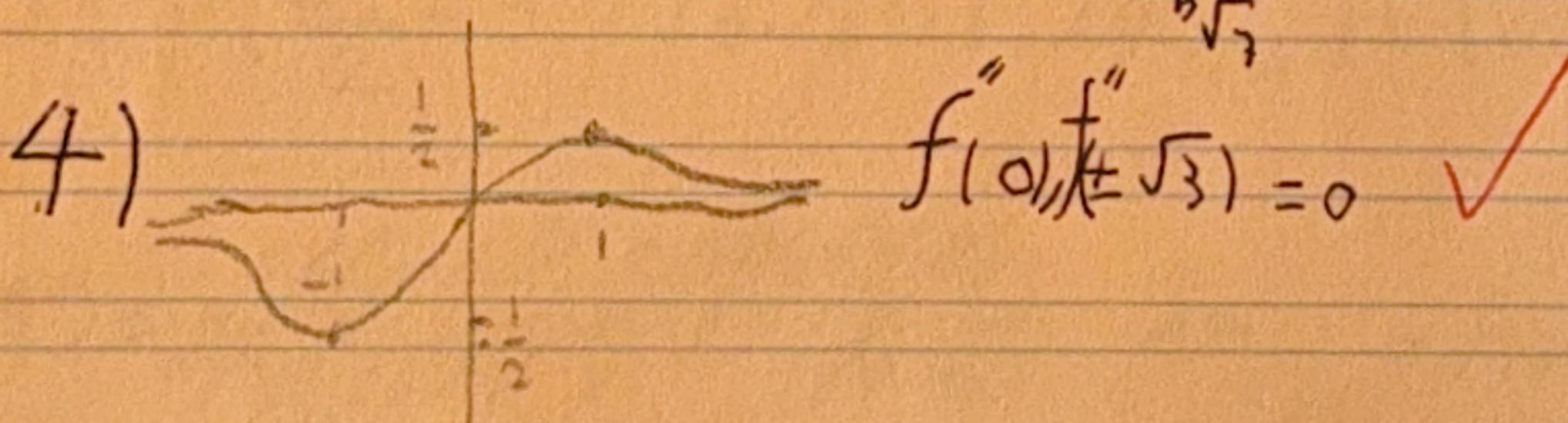
(7)  $-128 \cos(2n) \checkmark$

2a)  $y'(2) = 7 \Rightarrow y = 7n - 10 \checkmark$

2b)  $3n^2 y' + y^3 + 3n^2 y + n^3 y' = 0 \stackrel{y' = 0}{\Rightarrow} y(y^2 + 3n^2) = 0 \stackrel{y \neq 0}{\Rightarrow} \cdot \times \checkmark$

3a)  $\lim_{h \rightarrow 0} \frac{\frac{n+h}{n+h+1} - \frac{n}{n+1}}{h} = \frac{h}{\frac{(n+1)(n+h+1)}{1}} = \frac{1}{(n+1)^2} \checkmark$

3b)  $\lim_{n \rightarrow a} \frac{f(a_1) - f(a)}{n-a} = f'(a) = \frac{1}{1 + (\frac{a}{\sqrt{3}})^2} = \frac{1}{4} \checkmark$



5)  $(\frac{50}{n} + 8)(n+4) = 50 + \frac{200}{n} + 8n + 32 \Rightarrow \frac{-200}{n^2} + 8 = 0$   
 $\Rightarrow n = 5 \Rightarrow y = 10 \checkmark$

$$6) D^2 = 1^2 + n^2 \Rightarrow 2D D' = 2n \Rightarrow \frac{3}{2} D' = \frac{\sqrt{5}}{2} \Rightarrow D' = \frac{\sqrt{5}}{3}$$

$$\frac{dD}{dn} \cdot \frac{du}{dt} = \frac{\sqrt{5}}{3} \quad \frac{du}{dt} = \frac{dD}{dt} = -13.6 \Rightarrow \frac{du}{dt} = \frac{-13.6}{2.2} = -6.18 \text{ m.p.h}$$

$$7a) \int_{1.0}^{3.2} \sqrt{1+n^2} du = \frac{2}{3} (1+n)^{3/2} \Big|_{1.0}^{3.2} = \cancel{\frac{2}{3} (1+3.2)^{3/2}} \quad 2\sqrt{3} - \frac{2}{3} \checkmark$$

$$7b) \sin(n^2) = \sin(4) \checkmark$$

$$8b) \int_1^2 \ln \left| \ln u \cdot \frac{u^2}{2} - \frac{u^2}{4} \right|^2 du = 2 \ln 2 - 1 - \left( -\frac{1}{4} \right) = 2 \ln 2 - \frac{3}{4} \checkmark$$

$$10) 2\pi \int_{a/2}^a u^2 (a^2 - u^2)^{\frac{1}{2}} du = 2\pi \int_{\frac{a^2}{4}}^{a^2} \frac{1}{2} du (a^2 - u)^{\frac{1}{2}} = 2\pi \int_{\frac{a^2}{4}}^{a^2} u^2 (a^2 - u)^{\frac{1}{2}} du$$

$$= 2\pi \left( -\frac{2}{3} (a^2 - u)^{\frac{3}{2}} \right) \Big|_{\frac{a^2}{4}}^{a^2} = 0 - (-2\pi \sqrt{3} / 3 a^3) = 2\pi \sqrt{3} / 3 a^3 \checkmark$$

$$11) \left( \frac{2.7}{2} + 3.7 + 6.7 + 13.6 + 29.7 / 2 \right) = 40.2 \times 0.5$$

$$12a) \cancel{\text{Integration by parts}} \quad \frac{dm}{dt} = Am \Rightarrow \frac{dm}{m} = A dt \quad \checkmark$$

$$\Rightarrow \ln(m) = At + C \Rightarrow m = e^{At+C} = (e^{At})^C \Rightarrow C = 100 \Rightarrow \frac{1}{2} = 100 e^{-1600 A}$$

$$\Rightarrow m = 100 \cdot \left(\frac{1}{2}\right)^{t/1600} \Rightarrow 12b) 65 \text{ mg}$$

$$13) \int_0^{t_0} 1 dt = t_0 \quad \checkmark$$

$$14a) \frac{1}{1+u} = 1+u+u^2+\dots$$

$$\ln(1+u) = u + \frac{u^2}{2} + \frac{u^3}{3} + \frac{u^4}{4} + \dots \quad \times \cdot 7$$

$$14b) R=1 \quad \checkmark$$

$$14c) \frac{3}{12} + \frac{9}{8} = \frac{21}{8} \quad \times$$

$$14d) \left| \ln(1+u) - \sum_{i=1}^{\infty} u^i \right| < 1 \quad \checkmark$$

ANSWER