# EDEXCEL FOUNDATION

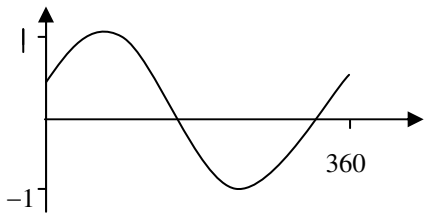
Stewart House 32 Russell Square London WC1B 5DN

**January 2003**

**Advanced Subsidiary / Advanced Level**

General Certificate of Education

Subject **PURE MATHEMATICS 6671** Paper No. **P1**

| Question number | Scheme | Marks |
|---|---|---|
| 1. | (a) $\frac{\mathrm{d}y}{\mathrm{d}x} = 10 \times \frac{3}{2}x^{\frac{1}{2}} \quad \left(= 15x^{\frac{1}{2}}\right)$ | M1 A1 |
| | (b) $7x + 4x^{\frac{5}{2}} + C$ | M1 A2(1,0) |
| 2. | (a)   Scales (−1, 1 and 360) | B1 |
| | Shape, position | B1 |
| | (b) (0, 0.5) (150, 0) (330, 0) | B1 B1 B1 |
| | (c) $(x + 30 =)$ 210° or 330° One of these | B1 |
| | $x = 180°, 300°$ M: Subtract 30, A: Both | M1 A1 |
| 3. | (a) $3^x = 3^{2(y-1)}$ $x = 2(y-1)$ (*) | M1 A1 |
| | (b) $(2y-2)^2 = y^2 + 7$, $3y^2 - 8y - 3 = 0$ | M1, A1 |
| | $(3y+1)(y-3) = 0$, $y = \ldots$ (or correct substitution in formula) | M1 |
| | $y = -\frac{1}{3}$, $y = 3$ | A1 |
| | $x = -\frac{8}{3}$, $x = 4$ | M1 A1ft |

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| 4. | (a) $\frac{a}{1-r} = \frac{1200}{1-r} = 960$ | M1 A1 |
| | $960\,(1-r) = 1200$ $\quad r = -\frac{1}{4}$ (*) | A1 |
| | (b) $T_9 = 1200 \times (-0.25)^8$ (or $T_{10}$) | M1 |
| | Difference $= T_9 - T_{10} = 0.0183105\ldots - (-0.0045776\ldots)$ | M1 |
| | $= 0.023$ (or $-0.023$) | A1 |
| | (c) $S_n = \frac{1200\left(1-(-0.25)^n\right)}{1-(-0.25)}$ | M1 A1 |
| | (d) Since $n$ is odd, $(-0.25)^n$ is negative, | M1 |
| | so $S_n = 960\,(1 + 0.25^n)$ (*) | A1 |
| | | |

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|---|---|---|
| 5. | (a) $\frac{\mathrm{d}C}{\mathrm{d}v} = -160v^{-2} + \frac{2v}{100}$ | M1 A1 |
| | $-160v^{-2} + \frac{2v}{100} = 0$ | M1 |
| | $v^3 = 8\,000 \qquad v = 20$ | M1 A1 |
| | (b) $\frac{\mathrm{d}^2C}{\mathrm{d}v^2} = 320v^{-3} + \frac{1}{50}$ | M1 |
| | $> 0$, therefore minimum | A1 |
| | (c) $v = 20 : C = \frac{160}{20} + \frac{400}{100} = 12$ | B1ft |
| | Cost $= 250 \times 12 = £30$ | M1 A1 |
| | | |

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|---|---|---|
| 6. | (a) P: $x = 0$ $y = -2$ | B1 |
| | Mid-point: $\left(\frac{(0+5)}{2}, \frac{(-2-3)}{2}\right) = \left(\frac{5}{2}, -\frac{5}{2}\right)$ | M1 A1ft |
| | (b) Gradient of $l_1$ is $\frac{3}{2}$, so gradient of $l_2$ is $-\frac{2}{3}$ | B1 |
| | $l_2$: $y - (-3) = -\frac{2}{3}(x - 5)$ | M1 A1ft |
| | $2x + 3y = 1$ | A1 |
| | (c) Solving: $3x - 2y = 4$ | |
| | $2x + 3y = 1$ $x = \frac{14}{13}$ | M1 A1 |
| | $y = \frac{-5}{13}$ | M1 A1ft |
| | | |

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| 7. | (a) $BM = \sqrt{(7^2 + 24^2)} = 25$ (*) | B1 |
| | (b) $\tan\alpha = \frac{7}{24}$ or equiv. and $\angle BMC = 2\alpha$, or cosine rule | M1 A1 |
| | $\angle BMC = 0.568$ radians (*) | A1 |
| | (c) $\Delta ABM$: $\frac{1}{2}(14 \times 24)$ (= 168 mm$^2$) (or other appropriate $\Delta$) | B1 |
| | Sector: $\frac{1}{2}(25^2 \times 0.568)$ | M1 A1 |
| | Total: "168 + 168 + 177.5" = 513 mm$^2$ (or 514, or 510) | M1 A1 |
| | (d) Volume = "513" × 85 mm$^3$ (M requires unit conversion) M1 | |
| | = 44 cm$^3$ A1 | |
| | | |

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|---|---|---|
| 8. | (a) $A$: $y = 1$ $B$: $y = 4$ | B1 |
| | (b) $\frac{dy}{dx} = \frac{2x}{25}$ $= \frac{2}{5}$ where $x = 5$ | M1 A1 |
| | Tangent: $y - 1 = \frac{2}{5}(x - 5)$ $(5y = 2x - 5)$ | M1 A1 |
| | (c) $x = 5y^{\frac{1}{2}}$ | B1 B1 |
| | (d) Integrate: $\frac{5y^{3/2}}{3/2}\left(= \frac{10y^{3/2}}{3}\right)$ | M1 A1ft |
| | $[\ ]^4 - [\ ]_1 = \left(\frac{10 \times 4^{3/2}}{3}\right) - \left(\frac{10 \times 1^{3/2}}{3}\right)$, $= \frac{70}{3}$ $(23\frac{1}{3}, 23.3)$ | M1 A1, A1 |
| | <u>Alternative for (d):</u> Integrate: $\frac{x^3}{75}$ | M1 A1 |
| | Area = $(10\times4) - (5\times1) - \left(\frac{1000}{75} - \frac{125}{75}\right)$, $= \frac{70}{3}$ $(23\frac{1}{3}, 23.3)$ | M1 A1, A1 |
| | In both (d) schemes, final M is scored using <u>candidate's</u> "4" and "1". | |