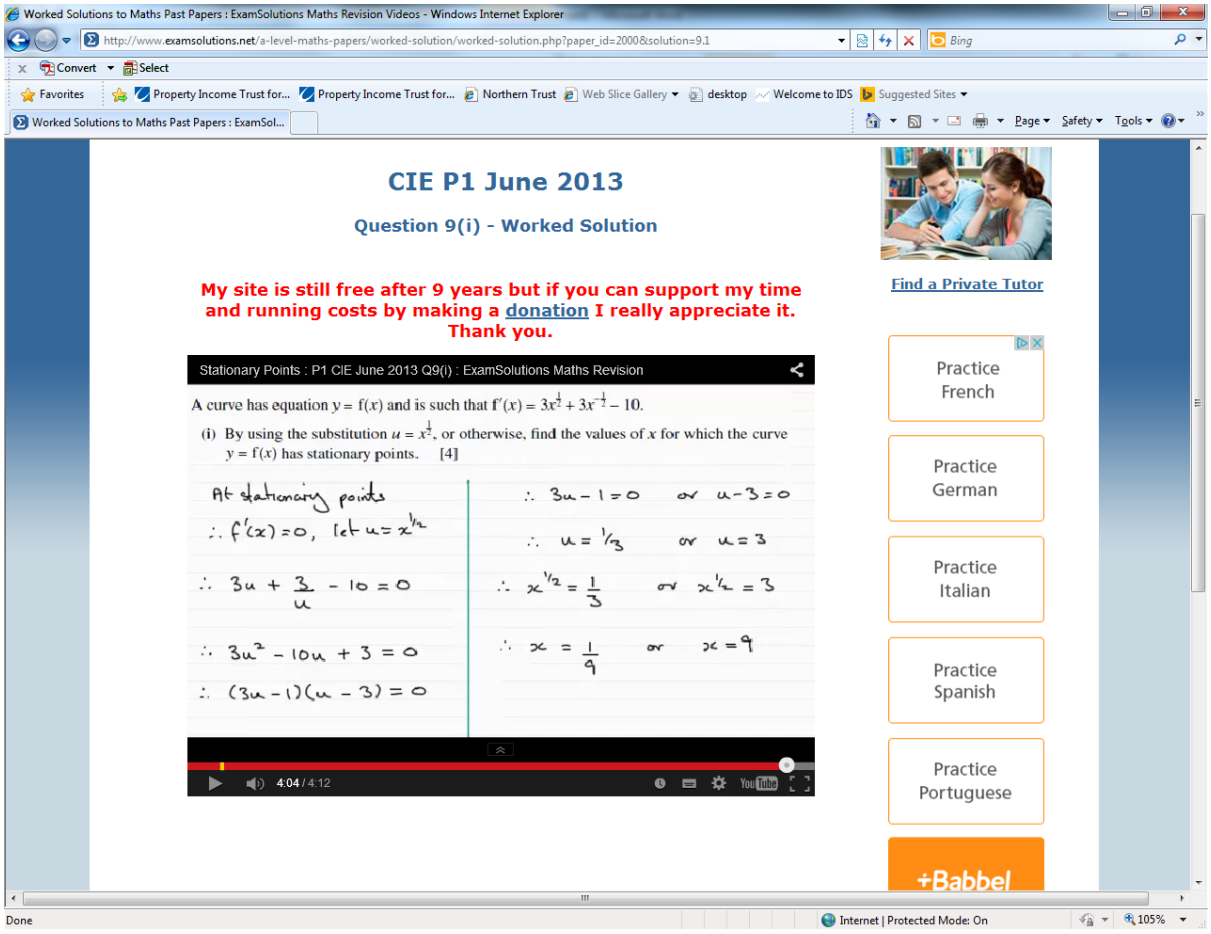
A curve has equation $y = f(x)$ and is such that $f'(x) = 3x^{\frac{1}{2}} + 3x^{-\frac{1}{2}} - 10$.

(i) By using the substitution $u = x^{\frac{1}{2}}$, or otherwise, find the values of x for which the curve $y = f(x)$ has stationary points. [4]

(ii) Find $f''(x)$ and hence, or otherwise, determine the nature of each stationary point. [3]

(iii) It is given that the curve $y = f(x)$ passes through the point $(4, -7)$. Find $f(x)$. [4]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A curve has equation y = f(x) and is such that f'(x) = 3x^½ + 3x^-½ - 10.
(i) By using the substitution u = x^½, or otherwise, find the values of x for which the curve y = f(x) has stationary points. [4]
At stationary points
∴ f'(x) = 0, let u = x^½
∴ 3u + 3/u - 10 = 0
∴ 3u² - 10u + 3 = 0
∴ (3u - 1)(u - 3) = 0
∴ 3u - 1 = 0 or u - 3 = 0
∴ u = ⅓ or u = 3
∴ x^½ = 1/3 or x^½ = 3
∴ x = 1/9 or x = 9
4:04 / 4:12
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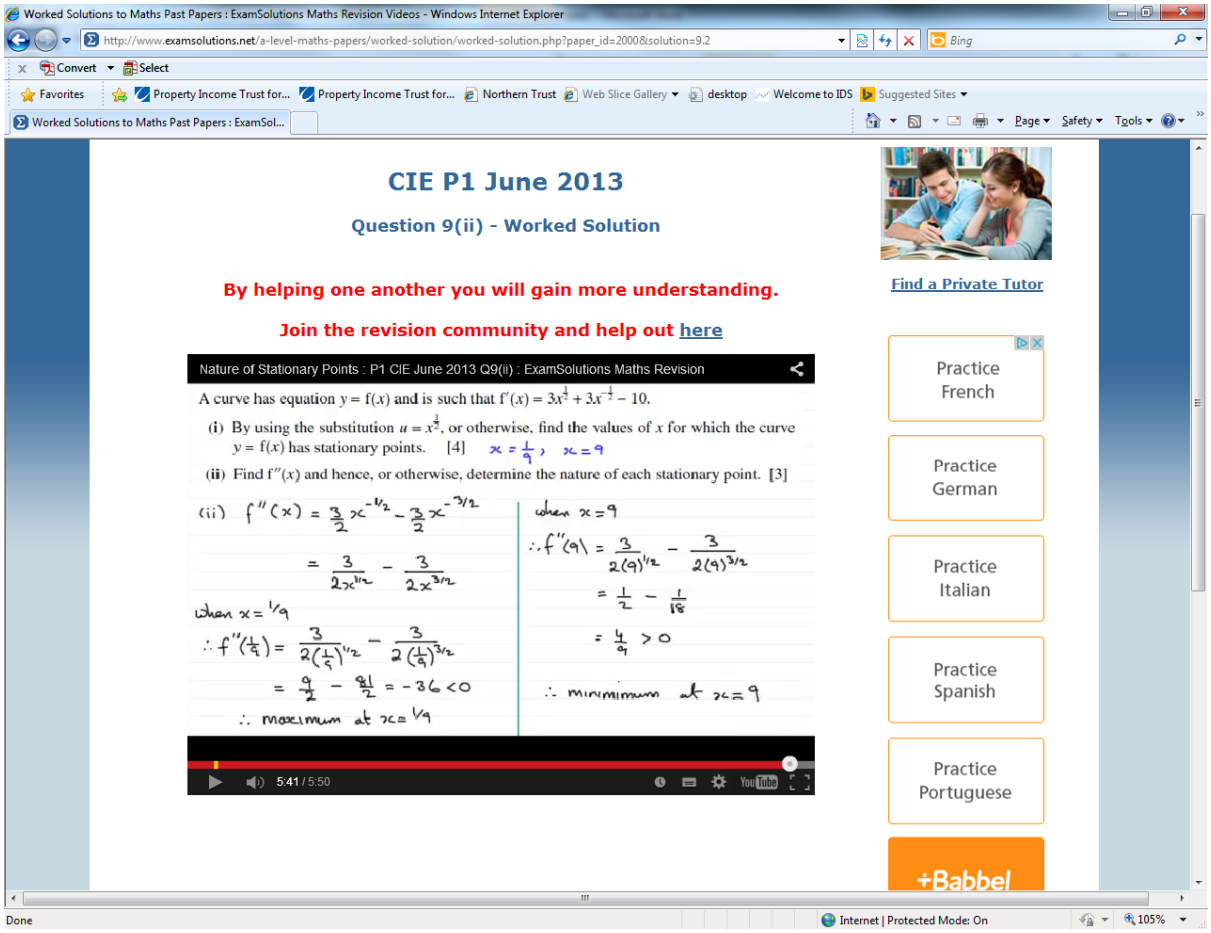
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Nature of Stationary Points : P1 CIE June 2013 Q9(ii) : ExamSolutions Maths Revision
A curve has equation $y = f(x)$ and is such that $f'(x) = 3x^{\frac{1}{2}} + 3x^{-\frac{1}{2}} - 10$.
(i) By using the substitution $u = x^{\frac{1}{2}}$, or otherwise, find the values of x for which the curve $y = f(x)$ has stationary points. [4] $x = \frac{1}{9}$, $x = 9$
(ii) Find $f''(x)$ and hence, or otherwise, determine the nature of each stationary point. [3]
(ii) $f''(x) = \frac{3}{2}x^{-1/2} - \frac{3}{2}x^{-3/2}$
$= \frac{3}{2x^{1/2}} - \frac{3}{2x^{3/2}}$
when $x = 1/9$
$\therefore f''(\frac{1}{9}) = \frac{3}{2(\frac{1}{9})^{1/2}} - \frac{3}{2(\frac{1}{9})^{3/2}}$
$= \frac{9}{2} - \frac{81}{2} = -36 < 0$
$\therefore$ maximum at $x = 1/9$
when $x = 9$
$\therefore f''(9) = \frac{3}{2(9)^{1/2}} - \frac{3}{2(9)^{3/2}}$
$= \frac{1}{2} - \frac{1}{18}$
$= \frac{4}{9} > 0$
$\therefore$ minimum at $x = 9$
5:41 / 5:50
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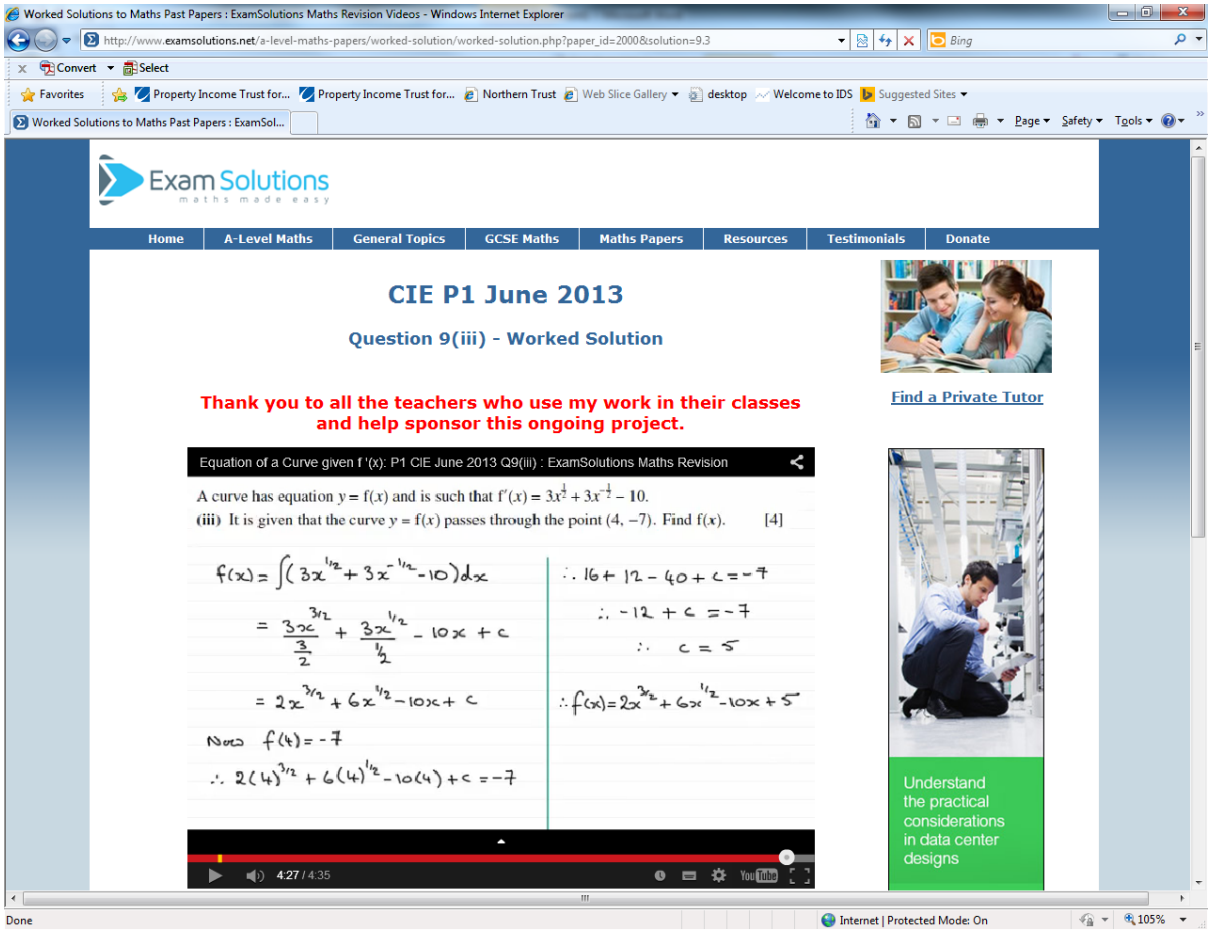
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Equation of a Curve given f '(x): P1 CIE June 2013 Q9(iii) : ExamSolutions Maths Revision
A curve has equation y = f(x) and is such that f'(x) = 3x^½ + 3x^-½ − 10.
(iii) It is given that the curve y = f(x) passes through the point (4, −7). Find f(x). [4]
4:27 / 4:35
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