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1 i) $y = \frac{x^2}{2x+1}$

Quotient rule

$= \frac{g(x)f'(x) - g'(x)f(x)}{g^2}$

$= \frac{(2x+1)(2x) - (x^2)(2)}{(2x+1)^2}$ $f = x^2$ $f' = 2x$ $g = 2x+1$ $g' = 2$

$\frac{f' \cdot g - g' \cdot f}{g^2}$

$= \frac{(2x)(2x+1) - (2x+1)(x^2)}{}$

$= \frac{(2x)(2x+1) - (2)(x^2)}{(2x+1)^2}$

$= \frac{4x^2 + 2x - 2x^2}{(2x+1)^2}$

$= 4x^2 - 2x^2 + 2x = 2x^2$

$= \frac{2x^2 + 2x}{(2x+1)^2}$

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Q1 iv) $y = \sec^3 4x$

$y' = 3\tan^3 4 \quad = 4 \times 3 = 12\tan^3$

Q2 i) $\int \frac{2x}{(4+3x^2)}\,dx$

let u be $(4+3x^2)$ $\frac{du}{dx} = 6x$ $du = 6x \cdot dx$

$dx = \frac{du}{6x}$

$= \int \frac{2x}{(4+3x^2)}\,dx = \int \frac{2x}{u} \cdot \frac{du}{6x}$

$= \frac{1}{u} \cdot \frac{du}{3}$

$= \frac{1}{(4+3x^2)} \cdot \frac{du}{3}$

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Q1 ii) $y = \sqrt{x^2+1}$ Chain Rule

~~$y = \frac{1}{2}x^2+1^{-\frac{1}{2}}$~~ ~~$y = \frac{1}{2}(x^2$~~

$y = \frac{1}{2}(\sqrt{x^2+1})^{-\frac{1}{2}}$

$\frac{1}{2}(\sqrt{x^2+1})(x^2+1)$ $x^2+1 = 2x$

$= \frac{1}{2\sqrt{x^2+1}} \times 2x = \frac{2x}{2\sqrt{x^2+1}}$

$= \frac{x}{\sqrt{x^2+1}}$

Q1 v) $y = (x + \sin 2x)$

$x - 1 \quad \sin 2x = 2\cos 2x$

$y' = 2\cos 2x$

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Q1 vi) $y = \frac{1-10x}{(2x-1)^2}$

$f = 1-10x \quad f' = -10$

$g = (2x-1)^2 \quad g' = 4$

$= \frac{f' \cdot g - g' \cdot f}{}$

$= \frac{(-10)(2x-1)^2 - (4)(1-10x)}{((2x-1)^2)^2}$

$= \frac{-20x + 10x - 4 + 40x}{((2x-1)^2)^2} \quad = (2x-1)^3$

$= \frac{30x-4}{(2x-1)^3}$

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(3) (a) $\frac{3}{(1+i)(2+i)} = \frac{3}{3+i+2i+i^2}$

$3 \times 3 + 1 = 10$

$= \frac{3}{1+3i} = \frac{3(1-3i)}{10}$

$= \frac{3(1-3i)}{10} = \frac{3}{10} - \frac{9}{10}i$

$\frac{3}{10}$

b) $z = (4+7i)(3-2i)$ $4 \cdot 3 - 7(-2) = 26$

$12 - 8i + 21i - 14i^2$ $4(-2) + 7 \cdot 3 = 13i$

$= 26 + 13i$

$a + b$

$a = 26 \quad b = 13$

$26^2 = 676$
$13^2 = 169$

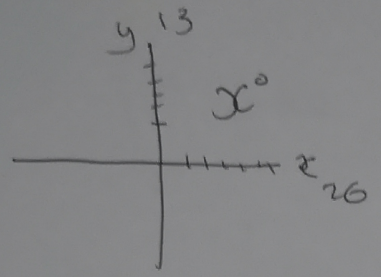
$r = \sqrt{a^2+b^2} = \sqrt{26^2+13^2} = 13\sqrt{5}$ or 29.07

$\theta = \tan^{-1} = \left(\frac{13}{26}\right) = 26.57°$ $r = 29.07$

PTO

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Q3 Continued b)



$r=(\cos\theta+\sin\theta) = 29.07(\cos 26.57° + \sin 26.57°)$

Polar form $= 29.07 \angle 26.57°$

Q3 i) $\left(\frac{1+i}{1-i}\right)^3$

$i^2=-1$

$= \frac{1+i}{1-i} \times i = \frac{1i+1^2}{1i+i^2} = \frac{1i+(-1)}{1i-(-1)}$

$= \frac{1+i}{1-i} \times \frac{(1+i)}{(1-i)} = \frac{1\times1+1i+1i+1^2}{1\times1-i-i+1^2}$

$= \frac{1+2i+1}{1+1^2}$

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$$(Q2(a)) = \int_0^4 e^{\frac{1}{2}x}\,dx$$

Let $u = \frac{1}{2}x$ $\quad \frac{du}{dx} = \frac{1}{2}x$ $\quad du = \frac{1}{2}x \cdot dx$

$$dx = \frac{du}{\frac{1}{2}x}$$

$$= \int_0^4 e^u$$

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Q3 iii) $= \frac{1+i}{1-i} - \underline{(1+2i)(2+2i)} + \frac{3-i}{1+i}$

↓

$(1+2i)(2+2i)$

$3+4i^2+4i+4i^2$ $\quad i^2=-1$

$3+8i^2+4i$

$3+8(-1)+4i$

$-5+4i$

$\frac{1+i}{1+i} \times \frac{1-i}{1-i} = \frac{(1+i)(1-i)}{(1+i)(1-i)} = \frac{1-i+i-i^2}{1+i+i-i^2}$

$= \frac{1-(-1)=2}{1+2i-(-1)}$

$1+i$

$\Rightarrow -5+4i+i$ (so far)

$\frac{3-i}{1+i} \times \frac{1-i}{1-i} = \frac{3-i-i+i^2}{1-i+i-i^2}$

$= \frac{3-2i+(-1)=4-2i}{1-(-1)=2}$

$\frac{4-8i}{4} = \frac{2}{1}i = 2i$

$= \frac{8}{8i} = i$

Answer

$=-5+4i+2i+i$

$=-5+7i$