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الثلاثاء ٢٠١٧/٤/١١	التفاضل و التكامل ١: الامتحان الثاني	الجامعة الأردنية
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In Q1-Q8, write the final answer in the provided blank, 2 points each.

Q1: $y = x\tanh^{-1}3x + \ln\sqrt{9-x^2}$, then $y' = \cdots$

سالب

$y' = \frac{x}{4x^2+1} + \tanh^{-1}(3x) \pm \frac{x}{2\sqrt{9-x^2}}$

$y' = x \frac{1}{(3x)^2+1} + \tanh^{-1}(3x)\cdot 1 + \frac{1}{2}(9-x^2)^{-\frac{1}{2}} \cdot -2x$

$\frac{-2x}{4\sqrt{9-x^2}}$

Q2: $\tanh x = \frac{12}{13}$, then $\cosh x = \cdots$

$\cosh(x) =$

Q3: $x^y = y^x$, then $y' =$

Q4: $T(z) = 2^z \log_2 z$, then $T'(z)$=...

$T'(z) = 2^z \cdot \frac{1}{z\ln 2} + \log_2 z \cdot 2^z \cdot \ln 2$

$2^z \cdot \frac{1}{z\ln 2} + \log_2 z \cdot 2^z \cdot \ln 2$

$h'(x) = \frac{1}{2}\left(4+3f(x)\right)^{-\frac{1}{2}} \cdot 3f'(x)$

Q5: $h(x) = \sqrt{4+3f(x)}$, $f(1) = 7$, $f'(1) = 4$ then $h'(1) = \dots$

$h(x) = \left(4+3f(x)\right)^{\frac{1}{2}} \longrightarrow h'(x) = \frac{1}{2}\left(4+3f(x)\right)^{-\frac{1}{2}} \cdot 3f'(x)$

$h'(1) = \dfrac{\frac{1}{2} \cdot 3f'(1)}{\left(4+3f(1)\right)^{\frac{1}{2}}} = \dfrac{\frac{1}{2} \cdot 12}{\sqrt{4+3\times 7}} = \dfrac{6}{\sqrt{4+21}} = \dfrac{6}{\sqrt{25}} = \dfrac{6}{5}$

$\boxed{h'(1) = \frac{6}{5}}$

Q6: $f(x) = \sqrt{3+x^2}$ then its linear approximation near $x = 1$ ...

$\cancel{f(1) = 4}$

Q7: $\lim_{\theta \to \frac{\pi}{6}} \frac{\sin\theta - \frac{1}{2}}{\theta - \frac{\pi}{6}} =$

Q8: The s... a...ympt... of ...

$\frac{2}{4}$

Solve Q9-Q11 completely, 5 points each.

Q9: Find the equation of the tangent line to the curve

$$x^2 + y^2 = (2x^2 + 2y^2 - x)^2 \quad \text{at the point } \left(0, \tfrac{1}{2}\right).$$

$\cancel{2x + 2y\frac{dy}{dx} = 2(2x^2+2y^2-x)\cdot(4x+4y\frac{dy}{dx}-1)}$

$\ln(x^2+y^2) = 2\ln(2x^2+2y^2-x) \longrightarrow \dfrac{2x+2y\frac{dy}{dx}}{x^2+y^2} = \dfrac{4x+4y\frac{dy}{dx}-1}{2x^2+2y^2-x}$

$\dfrac{x+y\frac{dy}{dx}}{x^2+y^2} = \dfrac{4x+4y\frac{dy}{dx}-1}{2x^2+2y^2-x} \longrightarrow \left(x+y\frac{dy}{dx}\right)\cdot\left(2x^2+2y^2-x\right) = (x^2+y^2)($

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Q10: Find all points on which the curve $y = 2\sin x + \sin^2 x$ a horizontal tangent.

$y' = 2\cos x + \cos^2 x = 0$

$\boxed{m = 0 = f'(x) = y'}$

$2\cos x + \cos^2 x = 0$

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Q11: Find all asymptotes of the function $f(x) = \frac{\sqrt{4x^2+1}}{3x-5}$.

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V.A

$3x - 5 = 0 \to 3x = 5 \to \boxed{x = \frac{5}{3}}$

$\lim\limits_{x\to\frac{5}{3}} \dfrac{\sqrt{4x^2+1}}{3x-5}$

$= \dfrac{\sqrt{4\left(\frac{5}{3}\right)^2+1}}{3\cdot\frac{5}{3}-5} = \dfrac{\sqrt{4\left(\frac{5}{3}\right)^2+1}}{0}$

$\boxed{= \infty}$

$\boxed{x = \frac{5}{3} \text{ is V.A}}$

H.A

$= \lim\limits_{x\to\infty} \dfrac{\sqrt{4x^2+1}}{3x-5}$

$= \lim\limits_{x\to\infty} \dfrac{x\sqrt{4+\frac{1}{x^2}}}{x\left(3-\frac{5}{x}\right)}$

$= \dfrac{\sqrt{4+\frac{1}{\infty}}}{3-\frac{5}{\infty}} = \dfrac{\sqrt{4+0}}{3}$

$\boxed{= \frac{2}{3}}$

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