HW 11

15\.

a) $\int fg \leq (\int |f|^p)^{\frac{1}{p}} (\int |g|^q)^{\frac{1}{q}}$

$\int_a^b x f(x) f'(x)$

$x f(x)$	$f(x)$
$f(x) + x f'(x)$	$f'(x)$

$f(x$

$2y =$ $x f^2(x) - (\int x f'(x) f(x)\, dx + \int f^2(x)\, dx)$

$x f^2 \;] _b^a$

b) $\int (f'(x))^2 dx^{\frac{1}{2}} (\int (x f(x))^2 dx)^{\frac{1}{2}} \geq \int f'(x)\, x f(x)\, dx$

$= -\frac{1}{2}$

$= \boxed{\frac{1}{4}}$

Extra: $\alpha(x)$ is cont. at $x = 0$ $\forall \varepsilon > 0, \exists$ $\delta > 0$

$|x| < \delta \Rightarrow |\alpha(x)| < \varepsilon$

if $x = 0$, trivially true $< (\frac{1}{2})^{\frac{1}{\delta} - 1} - \varepsilon$

$x \neq 0$, $\exists n$ s.t. $< \sum_n^\infty (\frac{1}{2})^n < \delta$

$\delta (\frac{1}{2})^n$

$n =$ $1 -$

$n = \log_{\frac{1}{2}} \delta$

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34.2 a) Lhopsitals: $\lim_{x\to 0} \frac{e^{x^2}}{1} = \boxed{1}$

b) $= \cancel{\lim e} = \boxed{4}$ $= F'(3) = \boxed{e^9}$

34.5 $\cancel{\lim_{x\to y} \frac{F(x) - F(y)}{x-y}}$ $\cancel{\lim_{h\to 0} \frac{F(x+h) - F(x)}{h}}$

$F(x) = \int_0^{x+1} f\,dt + \int_{x-1}^{0} f\,dt$

which is differentiable.

$F'(x) = f(x+1) - f(x-1)$

34.7 $) = \int -\frac{1}{2}\sqrt{u}\,du$ $u = 1-x^2$

$= -\frac{1}{3} u^{3/2} \Big]_{1}^{0}$

$= \boxed{\frac{1}{3}}$