Math 104 HW 11

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1 34.2

1.1 a

$\lim_{x\to 0} \frac{1}{x} \int_0^x e^{t^2} = \lim_{x\to 0} \frac{F(x)-F(0)}{x} = F'(0) = e^{0^2} = 1$

1.2 b

$\lim_{h\to 0} \frac{1}{h} \int_3^{3+h} e^{t^2} = \lim_{h\to 0} \frac{F(h+3)-F(3)}{h} = F'(3) = e^{3^2} = e^9$

2 34.5

$\int_{x-1}^{x+1} f(t)dt = \int_0^{x+1} f(t)dt - \int_0^{x-1} f(t)dt$
Because f is continuous on $\mathbb{R}$, $\int_0^{x+1} f(t)dt$ and $\int_0^{x-1} f(t)dt$ are differentiable on $\mathbb{R}$
$F'(x) = f(x+1) - f(x-1)$

3 34.7

Let $u = x^2$
$du = 2xdx$
$\int_0^1 x\sqrt{1-x^2}dx = \frac{1}{2}\int_0^1 \sqrt{1-u}du = -\frac{1}{3}(1-u)^{\frac{3}{2}}|_0^1 = -\frac{1}{3}(0-1) = \frac{1}{3}$