Please use the Snipping Tool (`https://mathpix.com`) on one single equation at a time! Performance is highest when the images are well zoomed in.

0.

$$f(x)=\frac{1}{\sqrt{2\pi\sigma x}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$$

1.

$$\mathcal{L}(q)=E_{q(\tau)}[\log p(\tau)]+E_{q(\theta)}[\log p(\theta)]+E_{q(\mathbf{z})q(\tau)}[\log p(\mathbf{z}|\tau)]$$

2.

$$\left(\begin{array}{c} ct' \\ x' \\ y' \\ z' \end{array}\right)=\left(\begin{array}{cccc} \gamma & -\gamma\beta & 0 & 0 \\ -\gamma\beta & \gamma & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{array}\right)\left(\begin{array}{c} ct \\ x \\ y \\ z \end{array}\right)$$

3.

$$\delta B_{\mu\nu}^{p}=\mathcal{D}_{\mu}^{pq}\xi_{\nu}^{q}-\mathcal{D}_{\nu}^{pq}\xi_{\mu}^{q}\equiv R_{\mu\nu\alpha}^{pq}\xi^{q\alpha}, \qquad \delta A_{\mu}^{p}=0$$

4.

$$\Phi^{(I)}=-\frac{se^2F(1-F)}{12\pi^2|m|}\int_1^{\infty}\frac{dv}{v\sqrt{v-1}}\frac{(1+F)(1+Av^F)-(2-F)(1+A^{-1}v^{1-F})}{Av^F+2+A^{-1}v^{1-F}}$$

5.

$$\Gamma_{\epsilon}(x)=[1-e^{-2\pi\epsilon}]^{1-x}\prod_{n=0}^{\infty}\frac{1-\exp(-2\pi\epsilon(n+1))}{1-\exp(-2\pi\epsilon(x+n))}$$

6.

$$T_x\left(\theta_r\right)=\left[\begin{array}{cccc} 1 & 0 & 0 & 0 \\ 0 & \cos\theta_r & \sin\theta_r & 0 \\ 0 & -\sin\theta_r & \cos\theta_r & 0 \\ 0 & 0 & 0 & 1 \end{array}\right]$$

7.

$$W_b^*=n(\hat{\theta}_b^*-\hat{\theta})'\hat{V}_b^*(\hat{\theta}_b^*-\hat{\beta})$$

8.

$$T_{j,i}^{(t)}:=\mathrm{P}(Z_i=j|X_i=\mathbf{x}_i;\theta^{(t)})=\frac{\tau_j^{(t)}f(\mathbf{x}_i;\boldsymbol{\mu}_j^{(t)},\Sigma_j^{(t)})}{\tau_1^{(t)}f(\mathbf{x}_i;\boldsymbol{\mu}_1^{(t)},\Sigma_1^{(t)})+\tau_2^{(t)}f(\mathbf{x}_i;\boldsymbol{\mu}_2^{(t)},\Sigma_2^{(t)})}$$

9.

$$\frac{\gamma}{4}(\frac{(D\Omega)^2}{\Omega^2}-2\frac{D\cdot D\Omega}{\Omega})+(1-\lambda)\mu\Omega^{-\lambda}-\frac{1}{4}(1-\frac{\epsilon}{2})\Omega^{-\epsilon/2}F^2=T_{\Omega}^{X}$$

10.

$$\langle v_{I,A\tilde{A}}(\tau) v^{\dagger}_{J,B\tilde{B}}(\tau')\rangle = \delta^{IJ}\delta^{AB}\delta^{\tilde{A}\tilde{B}} \int \frac{dk}{2\pi} \frac{e^{ik(\tau-\tau')}}{k^2 + r^2/\lambda^2} \equiv \delta^{IJ}\delta^{AB}\delta^{\tilde{A}\tilde{B}} \Delta(\tau - \tau')$$

11.

$$\Omega_{a\nu}(az, bz) = \frac{\bar{K}^{(b)}_{\nu}(bz)/\bar{K}^{(a)}_{\nu}(az)}{\bar{K}^{(a)}_{\nu}(az)\bar{I}^{(b)}_{\nu}(bz) - \bar{K}^{(b)}_{\nu}(bz)\bar{I}^{(a)}_{\nu}(az)}$$

12.

$$\Delta S \propto \int d^4 x n_s m v_\theta^2 \propto \ell \Delta t (n_s/m) \int d^2 x r^{-2} \sim (\ell \Delta t/\ell_P^2) \log(R_0/a_0) \sim \ell \Delta t/\ell_P^2$$

13.

$$\hat{H} = \int dr \Big(\frac{\hbar^2}{2M_B} \nabla \hat{\Psi}^+_m \nabla \hat{\Psi}_m + \frac{c_0}{2} \hat{\Psi}^+_m \hat{\Psi}^+_{m_1} \hat{\Psi}_{m_1} \hat{\Psi}_m + \frac{c_2}{2} \hat{\Psi}^+_{m_1} \hat{\Psi}^+_{m_2} F_{m_1 m_4} F_{m_2 m_3} \hat{\Psi}_{m_3} \hat{\Psi}_{m_4} \Big)$$

14.

$$\frac{d^2\psi(\zeta)}{d\zeta^2} + \frac{2\zeta - 1}{\zeta(\zeta-1)} \frac{d\psi(\zeta)}{d\zeta} - \frac{q + r(1-2\zeta)^2}{\zeta^2(\zeta-1)^2} \psi(\zeta) = 0$$

15.

$$D = \det \begin{pmatrix} D_{tt} - D_{tb}(Q^{-1})_{bc} D_{ct} & D_{tj} - D_{tb}(Q^{-1})_{bc} D_{cj} & D_{tb} \\ D_{it} - D_{ib}(Q^{-1})_{bc} D_{ct} & D_{ij} - D_{ib}(Q^{-1})_{bc} D_{cj} & D_{ib} \\ 0 & 0 & Q^{ab} \end{pmatrix}$$

16.

$$Z[A_+, \eta, \bar{\eta}] = \int D\bar{\psi} D\psi \exp\{i \int d^2x [\bar{\psi} i \gamma^\mu \partial_\mu \psi + \psi^\dagger_- A_+ \psi_- + \eta \psi^\dagger_+ \psi_- + \ \bar{\eta} \psi^\dagger_- \psi_+]\}$$

17.

$$\begin{aligned} \mathcal{P}_+ &= |\langle + | \psi \rangle|^2 \\ &= \langle + | \psi \rangle^* \langle + | \psi \rangle \\ &= \langle \psi | + \rangle \langle + | \psi \rangle \\ &= \langle \psi | P_+ | \psi \rangle \end{aligned}$$

18.

$$\int \operatorname{sech} u du = \sin^{-1}(\tanh u) \text{ or } 2 \tan^{-1} e^u$$

19.

$$\begin{aligned} P(e) &= \frac{1}{2} P(e|s_0) + \frac{1}{2} P(e|s_1) \\ &= \frac{1}{2} \int_{\frac{1}{2}A\sqrt{T}}^{\infty} p(r|s_0) dr + \frac{1}{2} \int_{-\infty}^{\frac{1}{2}A\sqrt{T}} p(r|s_1) dr \end{aligned}$$

21.

$$W(x,C) = P_* \exp[i \int_0^1 d\tau (q_\mu \theta^{\mu\nu} A_\nu(x+\xi(\tau)) + q_{\perp i} X^i(x+\xi(\tau)))]$$