$p^{-2(1-\gamma(g_*))}$. The complex interactions of the quantum field theory have affected the law of rescaling. Finally, since the fixed point is reached at large p, it is known as an ultraviolet fixed point.

An analysis of graph 1.3(b) follows similar lines. Near the fixed point the β function can be approximated by

$$\beta \sim +B(g - g_*) \tag{1.27}$$

which has the solution

$$\bar{g}(p) = g_* + C\left(\frac{p}{M}\right)^B \tag{1.28}$$

This means that for sufficiently small p, the integral in the exponential of (1.8) will be dominated by those values of p where $g(p)$ is close to g_*, giving

$$\begin{aligned} G(p) &\approx G(g_*) \exp\left[-(\log\frac{p}{M} 2(1-\gamma(g_*))\right] && (1.29)\\ &\approx C\left(\frac{1}{p^2}\right)^{1-\gamma(g_*)} && (1.30)\end{aligned}$$

Because this occurs at small p, this fixed point is called an infrared fixed point.

Once again, the complex interactions of the field theory have affected the law of rescaling. For this reason, the $\gamma(g)$ function is commonly known as the *anomalous dimension*, even if there is no fixed point in the theory.

1.2.7 Mass gap

Another feature of QCD, and yet to be proved rigorously by anybody, is that of a mass gap. A quantum field theory is said to have a **mass gap** if the energy spectrum has a positive greatest lower bound, but does not